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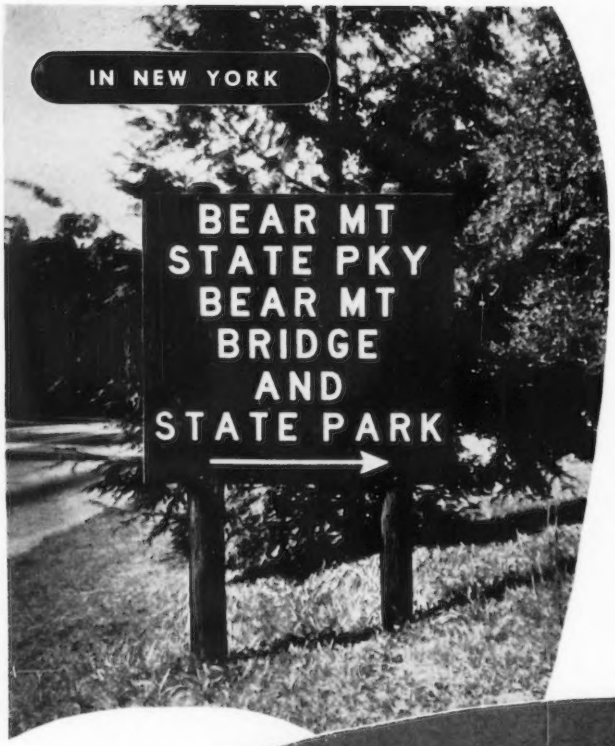

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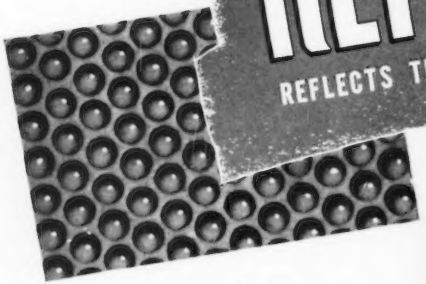

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Traffic Engineering

OFFICIAL PUBLICATION OF THE INSTITUTE OF TRAFFIC ENGINEERS

VOLUME XXII | DECEMBER, 1951 | NUMBER 3

COVER: Rice Institute Football Stadium opened on September 30, 1950. The stadium seats 70,000 and the parking lots constructed adjacent to the stadium provide space for 10,350 passenger vehicles and 100 buses—see article by Thos. E. Willier.

Traffic Engineering is that phase of engineering which deals with the planning and geometric design of streets, highways, and abutting lands, and with traffic operation thereon, as their use is related to the safe, convenient, and economic transportation of persons and goods.

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Frankly Speaking

As the Christmas season approaches, we, the Officers, Directors and Headquarters staff hope that the *Institute* has been helpful to you in your profession and in your endeavors. We pledge to exert every effort constantly to increase the value of the *Institute* to you.

The work of the *Institute* can only be guided by its Board of Direction and its manifold routines conducted through the Headquarters staff; actual contributions have been and will continue to be made by its members and by its friends who see in the work of traffic engineers opportunities for civic good in the improvement of highway transportation throughout the cities and states of the nation.

Members of the *Institute*, serving on committees, represent a treasure house of technical resources. TRAFFIC ENGINEERING is your official technical publication now read by transportation engineers throughout the country. TRAFFIC ENGINEERING is coming to be one of the leading publications in highway transportation. Your contributions of technical and research material receive widespread attention from a select and discriminating group of readers. Consequently, your contributions can mold technical opinion.

The forthcoming Traffic Engineer's Technical Notebook should begin to be a growing symposium of traffic engineering techniques, practices and experiences. Every traffic engineer will wish to make his contribution to the growing literature on standard practices that will be contained therein.

We, the Officers, Directors and Headquarters staff wish every ITE member and every subscriber to and advertiser in TRAFFIC ENGINEERING a very Merry Christmas and Happy New Year. May your future undertakings meet with even greater successes than in the past. May all of you continue to enjoy the rich glow of satisfaction in knowing that your job has been well done.

THE OFFICERS, DIRECTORS AND HEADQUARTERS
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Traffic Engineering and Highway Planning in Michigan

By Charles M. Ziegler
State Highway Commissioner

TRAFFIC engineering and highway planning are not exact sciences. They were born with traffic and have developed as traffic grew. That process still is going on in their organization set-up as well as in their operations.

Development In Michigan

During the first ten or fifteen years after the Michigan State Highway Department was created in 1905, it was mainly concerned with the improvement of roads for the miraculously multiplying automobiles. Planning in this early period was roughly but correctly aimed at aiding the counties and townships which did the actual construction, to meet as far as possible the universal demand for better roads. The Department had little time and no authority to deal with the rapidly emerging traffic problems; their solution was left largely to local agencies.

Early Activities

Under this system highway improvement did not keep pace with traffic and so in the period 1919 to 1927 more ample funds were provided and the Department was made responsible for construction and maintenance on the state trunkline system. The enlarged responsibility and the greater volume of operations required increased attention to planning. At the same time, mounting traffic volumes and the wider range of travel emphasized the need for more effective controls of traffic and better protection and direction service for motorists.

Traffic control by local authorities resulted in regulations which varied from place to place and which were apt to be extremely restricted. But, beginning in 1919, laws were passed conferring certain responsibilities regarding trunkline traffic on the state highway commissioner, setting up statewide speed regulations, and establishing the Department's practice regarding traffic control devices as the standard for all highway agencies in the state. In some of these matters, the commissioner was given administrative authority and duties, jointly with the commissioner of state police.

The field and record work involved in the commissioner's gradually increasing traffic engineering responsibilities and duties, was assigned to the Maintenance Division. An engineer in that Division was designated to handle these tasks, and in 1933 he was made Assistant Maintenance Engineer in Charge of Traffic and Safety.

Divisions Organized

It was not until 1939 that traffic engineering and highway planning were formally given divisional status in the Department, with the organization of the Traffic and Safety Division and the Highway Planning Division. They both evolved from the Michigan Highway Planning Survey and their staffs were largely recruited from personnel which had served in that research and study project.

Highway delineators and reflectorized lane markings aid and protect the night driver on this Michigan state trunkline. Reflectorization of certain pavement markings is being extended to a greater mileage each year.

As in other states, our highway planning survey had gathered large bodies of data which were pertinent to the problems of traffic engineering and highway planning. The need for the services of these two functions had long been felt and had been partially met by other means, but their organization as divisions at this time was due largely to the store of information that the survey had in its files, and to the availability of the experienced engineers whom the survey had trained. Indeed, it is likely that the latter condition was largely responsible for the decision to create two divisions rather than to combine the functions in one organization.

In 1942, however, it was necessary to revise the Department's set-up to meet wartime demands and conditions, and one of the features of this reorganization was the merging of the two divisions into a new and still existing Planning and Traffic Division. Once merged, the advantages of gearing these activities together have been so clearly demonstrated that their union is undoubtedly permanent.

Projects—Past and Present

The war had still other effects. Almost immediately after the division was organized it was called upon to act in successive defense and war emergencies and performed several valuable tasks during the war period.

Wartime Services

The location of the giant Willow Run Army Bomber Plant in rural territory 20 miles from the Detroit labor reservoir, posed a transportation problem whose solution was vital to efficient operation. The difficulty was not fully

realized by either the Army or the Ford Motor Company, which was to operate the plant, but the traffic engineers were able to produce evidence that existing highways in the area were inadequate for the expected load. On the basis of this showing, the Department enlisted the cooperation of the Army and the Federal Government and planned and built the expressways which enabled the plant to be manned and to produce the planes which were so important to the later phases of the war.

Tire and gasoline rationing became a vital issue after Pearl Harbor. Sensing the danger that too stringent restrictions would be imposed unless there was a clear understanding of industry's dependence on highway transportation, the Planning and Traffic Division initiated a survey to get the facts. The resulting report, "The Transportation of Materials and Workers in War Industries in Michigan," was influential in shaping subsequent regulations.

To further conserve vehicles, tires and gasoline, the Department's traffic engineers devised a ride-sharing plan for industrial workers which was first called the "Pontiac Plan" after the city in which it was first installed. When it was used later in other parts of the country under the sponsorship of the Office of War Transportation, it was known as the "Michigan Plan."

Postwar Operations

Transition to peacetime conditions involved some special readjustments as well as the resumption of the regular routine of duties. Traffic engineering forces, while shifting various signs and signals back from wartime operation, made hundreds of studies to bring all traffic control devices into step with existing conditions and needs. Particular attention was given to speed control zones and traffic control signals.

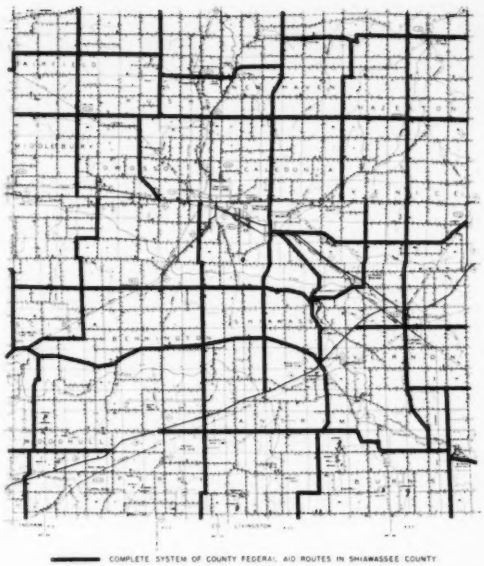
The planning branch took up again the considerably expanded work program of highway planning survey projects which it conducts in cooperation with the Bureau of Public Roads. In addition to regular fiscal reports, and traffic and speed observations, this program currently includes a statewide traffic survey and a road and street inventory. This branch also devised a method for classifying highways and has virtually completed the classification of rural roads; the urban phase of this work is in progress.

In furtherance of the Department's postwar construction program, the Division provided various planning and traffic services and data. The Division was also assigned the responsibility for conducting metropolitan area traffic studies which have now been made in 18 Michigan communities.

Highway Needs Study

Personnel from the Planning and Traffic Division made up most of the technical staff for the study of highway needs conducted in 1946 and 1947 by highway and user groups under the leadership of the Michigan Good Roads Federation. This engineering analysis of highway administration, traffic, condition, and support, produced a report, "Highway Needs in Michigan," which was submitted to the Governor and the Legislature in 1948.

Early this year, most of the recommendations presented by the study committee were enacted into law. The new statutes provide increased revenues for all highway agencies, improves their administrative and engineering direction, and brings them into a stable and more cooperative relationship with one another. Several engineers from the Planning and Traffic Division have been transferred to a Local Unit



Complete county Federal-aid Secondary system selected and approved for a central Michigan county.

Section recently created within the Department to aid the commissioner in carrying out his inter-agency duties under the new highway set-up.

Organization and Functions of Division

The Planning and Traffic Division is headed by a Planning and Traffic Engineer who is a member of the departmental staff. To assure specialized attention to its two distinct but related fields of operation, he is assisted by an Assistant Planning Engineer in charge of Highway Planning and an Assistant Traffic Engineer in charge of Traffic Engineering.

These two branches perform work proper to their respective fields, including duties connected with the administrative responsibilities of the Commissioner. The internal organization of each is based upon function. When their individual operations are examined, it is found that most of their routine and special duties, while distinct and separate, are dovetailed together to produce a single end product. That end product is the safe, economical and efficient movement of people and goods. In many of their activities, their cooperation is direct and constructive.

Traffic Engineering Branch

The Traffic Engineering Branch of the Division is divided into three sections: Traffic Control, Traffic Planning and Traffic Surveys, each headed by an experienced Traffic Engineer. Under each of the section heads are groups charged with the detail work and analysis in each category covered by the section, as described in following paragraphs. A District Traffic Engineer is assigned to each of the Department's nine districts. These District Traffic Engineers are the Department's representatives in these areas on matters pertaining to traffic engineering. The responsibility of these traffic engineers covers the servicing of requests, cooperative work with other governmental agencies, checking of plans

and surveys for traffic engineering devices, investigations, reports and recommendations and all other technical matters of a traffic enginering nature.

Traffic Control

The major feature of the Division's *sign* activities is the statewide re-signing program. This program, the first of its kind undertaken as a Federal Aid project, was initiated five years ago, but delays postponed actual work until late 1949. The first phase, which involves complete modernization of signs and sign applications on the 13 major trunkline routes on the State systems, is now nearing completion. When the job on these principal routes is done, some 24,000 new signs will have been placed.

Plans are made and annual programs are being drawn up for the re-signing each year of additional trunkline routes, selected in the order of their importance, until the sign equipment on the whole state system has been rehabilitated.

The continuing *signal program,* in addition to installing new equipment where necessary, is completely modernizing the operation of the older installations. It is the aim of the program to obtain progression wherever signal placement and traffic patterns permit. Careful studies are being made of traffic and accident conditions before and after signals are put in operation. The results are throwing much valuable light on the proper usage of signals and provides good data for determining whether or not one of these devices will improve operation of a given location.

The Division's *pavement marking* has now been organized into practically a routine annual operation. Designs and color scheme for the markings have been standardized; the locations where markings are to be applied are in the record; and machines and crews for applying the paint have been developed to a high degree of efficiency. However, the mileage on which center lines and no-passing lines are marked with reflectorized paint is being increased year by year and, of course, new construction and favorable tests of newly developed materials call for modifications of procedures from time to time.

Regulation of speed and parking is handled by a section usually acting with other state or local authorities. "Careful and prudent" speed is the only blanket speed limitation on rural roads of Michigan, but the State Highway Commissioner, acting with the Commissioner of State Police, is empowered to make traffic engineering studies and to establish speed control zones on the basis of the findings.

Michigan state law forbids parking on rural state trunklines and gives the Commissioner power to regulate or prohibit parking on trunkline routes on city and village streets. As may be imagined, difficulties sometimes arise in obtaining civic cooperation in urban locations where parallel parking or no parking is required. The Department ordinarily tries to secure assent to the more stringent parking regulations by means of education and demonstrations of the necessity for such regulation.

Traffic design is one of the most important and active functions of the traffic engineering branch. Road plans for proposed construction are submitted to the engineers of this section who review them for safe and efficient traffic operation. The proper width of median strips in varying locations and under different types of traffic usage, is being studied. Particular attention is given at this time to the design of expressway ramps and the scheme of channelization on the expressway roads themselves. Also being investi-

Traffic flow map shows estimated usage of selected state trunkline routes and other arterial streets in an industrial city.

gated is the incorporation of certain features of limited access in designs for roads for which full expressway design is impracticable.

Roadside control is closely allied with traffic design and, in this time of rapid commercial development along suburban and rural highways, is of equal importance. Aside from set-back regulations, the principal legal basis for controlling roadside development in Michigan is the Department's authority regarding driveway openings to state trunklines and a 500-foot clear vision requirement at highway intersections. However, the Division has been quite successful in working cooperatively with owners of existing roadside places to obtain improved off-road parking areas and in establishing desirable access drives.

The roadside control section has developed standardized plans for entrance and exit roads which have been published as a bulletin. Early contacts with owners of projected establishments have produced good results in the form of safe and convenient driveways. Particularly in the case of drive-in theaters, this policy usually has resulted in good working cooperation from proprietors in planning for the very difficult traffic movement at these places.

Accident reports furnished by the state police are basic data in directing traffic engineering attention to hazardous situations. All reports of accidents on state trunklines are analyzed by the Accident Section. Those involving road conditions are forwarded to the Maintenance Division with recommendations for remedial action. In cases where traffic

Carefully designed entrance and exit drives and ample parking area reduced traffic friction around this restaurant at a heavily traveled intersection just north of Detroit.

operation appears to be a cause, the report is sent to the traffic engineer in the district where the accident occurred, who examines the location and recommends such measures as he deems necessary.

Traffic Planning

This section is mainly concerned with the underlying factors in efficient and safe traffic movement. Its work in this direction is largely research and investigation in such fields as highway and intersection capacity, the operation of one-way streets, and the effects on traffic capacity of signalization and non-traffic usage of roadways. The incidence of these factors on highway design is discussed in two reports currently being prepared, "Application of Modern Design Principles" and "Driver and Traffic Behavior."

This section works closely with the System Planning Section of the Highway Planning Branch. Difficult problems of traffic accommodation are frequently studied jointly with the Route Planning Engineer.

Traffic Surveys

The Surveys Section is attached to the Traffic Engineering Branch for which it makes many speed studies, volume and classification counts, and parking surveys. It is, however, actually a service section for the whole Division, making surveys and securing data for the planning sections and making the traffic observations involved in the work program of the Highway Planning Survey.

The survey forces have conducted the field work for the metropolitan area traffic studies which now has been completed in 18 Michigan cities. They are now in the midst of a statewide road and street inventory and a statewide traffic survey.

The section has in addition to its field survey force, an office staff which organizes and tabulates field data for further study by other sections. It also has a small shop for servicing and maintaining the automatic traffic recorders, speed detectors and loadometers.

Traffic Engineering Cooperation With Other Agencies

Other agencies have a part in much of the work of the Traffic Engineering Branch. Joint authority with the Michigan State Police in establishing rural speed zones and dependence on them for accident reports, have been mentioned. Cooperation is also given all police agencies in traffic control matters which involve enforcement.

The State Safety Commission is composed of state officials representing the four bases of traffic safety: driver licensing, by the Secretary of State; enforcement, by the State Police Commissioner; education, by the Superintendent of Public Instruction; and highways, by the State Highway Commissioner. It carries on and participates in a year round series of projects emphasizing and promoting safety.

The Department's Traffic Engineers from time to time give technical assistance to Michigan cities and villages which have no traffic engineer, in working on problems of local traffic movement. Of statewide significance, is the "Manual of Uniform Traffic Control Devices" which is prepared and distributed by the Division and which by law sets standards for the design and use of signs, signals, and pavement markings for all road and street agencies in the state. A new edition of this manual is nearly ready for publication.

Highway Planning Branch

The Highway Planning Branch represents and performs several phases of the highway planning function.

Modern directional sign at a rural intersection

In the first place, it is the direct offspring of the original Highway Planning Survey of 1936-37. As such it makes studies and regularly reports much fiscal and other data to the Bureau of Public Roads as a part of that project in its continuing form.

In the second place, the Branch carries on many of the planning tasks which grew out of the research methods initiated by the highway planning surveys. It studies traffic survey results and the economic and social factors which produce traffic, and from these indications it has classified the rural roads of the state and grouped them into highway and road systems. The data from the metropolitan area traffic studies are analyzed and, in cooperation with local agencies, major arterial plans and urban state trunkline systems are set up in the principal cities.

Thirdly, the sections in this Branch are constantly conducting investigations and analyses of traffic desire and operations, of basic principles of highway and street design, and of factors affecting accident occcurrence and traffic efficiency. It also gathers the significant data in fields which influence traffic and fiscal developments and makes estimates of future travel and income on the basis of these factors.

And fourthly, but by no means finally—for the Branch often is asked for any and all kinds of information pertinent to highway administration—it has been made the official keeper of the records of the physical plant of the state highway system and is responsible for the preparation and keeping up to date of a "Long Range Plan" for the development of the Trunkline System.

To perform its regular functions and to meet the demands for special information, the Branch is organized into three sections: System Planning; Records and Road Inventory; and Financial and Economic Research.

System Planning Section

This section has two wings responsible, respectively, for rural highway planning and urban highway planning. Although most of the work of each is in an individual field, some problems require the closest integration of their operations.

It has been pointed out that the planning engineers had devised and carried through a method of road classification. The results of this work were indispensable in the rural phase of the Highway Needs Study which required careful

grouping of roads in functional classes in order to determine necessary standards of improvement.

The rural planning engineers are now using the same classification method in the selection of routes for county Federal-aid Secondary systems of rural roads. In this task they are acting for the Department as the representative of the Bureau of Public Roads in negotiations with counties, as prescribed by the Federal Highway Act of 1944.

As in the case of the original classification, the selection of the county Federal-aid Secondary routes is made on the basis of data indicating the usage of the various roads, the traffic attraction of pertinent cities and market centers, and the density of rural settlement. At the present time complete systems have been selected for 17 of the 83 counties in the state.

The rural planning engineers also furnish planning information to the Department's Road Engineer and Route Planning Engineer regarding routes where improvements, relocations, or changes of classification are contemplated.

For the most part, current operations in *urban highway planning* stem from the metropolitan area traffic studies which have been in progress in Michigan since 1946. The System Planning Section receives the field data from these studies from the Surveys Section and arranges them in the form of reports for further study and analysis by this section and by local planning officials.

The Department's primary interest in the results of these urban traffic studies is the improvement of state trunkline service in the areas studied. For this reason, the main objective of the urban highway planning engineers is the selection of an urban system of state trunkline routes in each city. However, inasmuch as it is desirable to integrate such a system with the city's transportation system, ordinarily the first step is to cooperate with local engineers in formulating an arterial street plan. From this network, the logical trunkline routes are picked which will best serve the rural trunkline trips and the local movements which will use them.

Once an urban trunkline system has been selected and approved by the Department and the city involved, it is embodied in a report which becomes the advance blueprint for all future state highway operations in that area. The advantages of such a blueprint are many; it permits channeling the available state and municipal funds into improvements of permanent value; it sets a stable pattern on which future non-highway development can be based; and it arms the highway administrator against possible pressures from non-public interests.

State trunkline plans have been formulated and substantially approved by the Department and local governments in four cities. The trunkline report for one of these cities has been published and reports for six others are nearing completion.

Financial and Economic Research Section

This section has as its routine duty the collection and reporting of the state's highway fiscal data for the Bureau of Public Roads as a part of the Department's continuing highway planning survey work program. Monthly reports are made of Gas and Weight Taxes collections, and annual reports of county highway financial operations. In addition, a three-year study was made of city and village highway income and expenditures and the results were published this year in a report. "Financial Support for Streets—1946, 1947, 1948."

However, the principal function of this section is the study, analysis and interpretation of highway transportation data to establish trends and forecasts of highway usage and revenues. Arrangement in graphic, narrative, or report form, of highway finance, economic, and statistical data for administrative and legislative guidance, and the formulation of the elements of highway economics for use in highway planning.

The section has done much analytical work in an attempt to select times when short traffic counts can be made on certain groups of highways which will represent some constant proportion of annual average daily traffic. For the past two years a study has been in progress which determines by statistical processes, the association of roadside development with accident occurrence. A first progress report, "How Roadside Features Affect Traffic Accident Experience," was published a year ago and a second and similar report recently came off the press.

Records and Road Inventory Section

This section's main function is the continuous inventory by miles of the physical characteristics and cultural development of the state trunkline system, county road systems, and city street systems and the establishment and maintenance of a uniform system of records of the construction, maintenance, operational and other activities related to the state trunkline system, for use of all the divisions in the State Highway Department. This uniform system of records is currently being established by the Control Section method. In addition to these activities the section is responsible for the following activities: preparation and maintenance of various records of state, Federal-Aid, and county road systems—these records refer to the statutory and jurisdictional establishment, physical and design development, construction activities, contract awards, location descriptions, mileage logs, and other records required for the preparation of reports and for general information and use; preparation of material for the Official Highway Map, the Truck Operators' map, and other maps; preparation of statistical reports and tabulations on state, county, and Federal-aid systems for various Federal, state and local agencies.

Service Sections

Mapping and Graphic

Operations of the Division require a large amount of mapping and graphic work. A Mapping and Graphic Section prepares traffic flow maps, traffic signal installation drawings, intersection condition diagrams, speed control zone sketch maps, and state and Federal-aid Secondary revision and route establishment and abandonment maps. It also designs graphic interpretations and presentations for both branches of the Division.

This section has begun a complete revision of the county maps originally drawn as part of the 1936 highway planning survey. Data for the revision is provided by the statewide road and street inventory now in progress. For the Department as a whole, the section revises and supervises the production of the two editions of the Official Highway Map which are issued each year.

Report Writing

This section writes and edits the reports made from time to time of studies or projects completed by other sections of the Division. A routine responsibility is the preparation of the biennial reports of the State Highway Commissioner.

(Continued on page 110)

Modern Traffic Engineering in Houston

By Thos. E. Willier
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This is the seventh in a series of articles to be published in "Traffic Engineering" magazine. Articles of a similar nature, written by traffic engineers of cities of various sizes in several parts of the country, will appear in future issues of "Traffic Engineering."

TRAFFIC engineering is recognized now as a specialized profession and traffic engineers are being assigned more authority to control traffic movements and parking of motor vehicles. The day when any person capable of painting a line or installing a sign could be considered a traffic engineer is gone forever. The traffic engineer of today must be qualified through technical education and experience to cope with all problems connected with the efficient and safe transportation of persons and goods in rural and urban areas.

Engineers responsible for the design and construction of roadways have found it necessary to revise their concepts of acceptable facilities as a result of traffic engineers' evaluations of motor vehicle operations. Not too many years ago, if a roadway subgrade and surface would withstand the impact and wear of motor vehicle traffic and would further resist climatic conditions, then the roadway was considered satisfactory. This is no longer true. The utility value of a roadway, as measured by its ability to transport motor vehicle traffic safely and without congestion and delay, must be given even more basic consideration than construction details.

Most streets were not built to accommodate present traffic loads and to provide for movements of heavy trucks and buses as well as high-speed automobiles. Provisions were not made for multi-lane movements of vehicles and for the parking of motor vehicles at the curb in cities. Traffic engineers have been endeavoring to regulate traffic movements and parking on such roadways to meet requirements of motorists and operators of commercial vehicles. The problem has not been an easy one because traffic and parking regulations are of a restrictive nature and they generally necessitate a change in custom and habit of individuals.

Good roadway design will minimize the traffic regulations and restrictions which must be imposed but it will not completely eliminate such controls. In any kind of highway facility, speed must be regulated, the direction of traffic movements must be specified, consideration must be given to the cross movements of pedestrian and motor vehicle traffic at particular locations, provisions must be made for parking and for the loading and unloading of commercial vehicles, and access to adjacent property must be considered. It is probable that traffic engineers in the past have placed too much emphasis upon the installation of traffic control signs, signals and markings and too little upon the establishment of traffic control and parking regulations. Engineers concerned with the improvement of roadways undoubtedly have resorted to construction in order to solve many traffic movement problems when the adoption of planned traffic regulations would have been more effective.

Modern signal installation in Houston.

Houston's Traffic Engineering Department

In Houston, a city with a metropolitan population of over 750,000 and an area of over 160 square miles, the operation of 300,000 registered vehicles produces many problems which traffic engineers must solve. The Traffic Engineering Division was established in 1940 and because of ever-increasing responsibilities since that time, additional authority has been delegated to the City Traffic Engineer. In 1947, a Traffic and Transportation Department, on a par with other major city departments, was established. The Director of the Department of Traffic and Transportation, who is also the Traffic Engineer, reports directly to the Mayor and he has been delegated sufficient authority to establish all regulations pertaining to the movements and parking of motor vehicles. He is authorized to determine locations for

traffic control devices and to arrange for the installation of such devices with funds provided in his departmental budget. Unfortunately, owing to the lack of recognition and understanding of the specialized nature of the work of traffic engineers and of the necessity for following a traffic engineering approach in solving many local problems, traffic engineering offices in other cities do not have similar authority. An adequate budget and a qualified staff of engineers are needed in a Traffic Engineering Department. Five employees of Houston's Department are members of the *Institute of Traffic Engineers* and four are graduates of the Yale University Bureau of Highway Traffic.

It is essential that a particular person or office in a city be assigned the responsibility for conducting traffic surveys and investigations and for the establishment of traffic control and parking regulations if local traffic conditions are to be improved. Traffic surveys, plans and programs are good but they will not produce desired results unless there is some type of "follow through" action in the nature of street construction and improvements or in the establishment of traffic control and parking regulations. If a city does not have a traffic engineering department, similar to Houston's Department, delegated with authority to take action in connection with traffic and transportation problems, such a department should be organized. In smaller cities, some official in the police department, the street department or other local city department should be assigned the responsibility for conducting traffic surveys and investigations and for solving local traffic problems.

Traffic Engineering Activities

City traffic engineering activities may be divided into two broad classifications; first, adoption of immediate remedial traffic control measures and, second, traffic planning. A great amount of time is required to investigate traffic problems referred directly to a traffic engineering department or through the mayor, city manager or other city officials to that department. Elective officials of a city are vitally concerned in the matter of giving adequate consideration to all requests and complaints received from citizens so the traffic engineer must be prepared to conduct field surveys and investigations and endeavor to satisfy complainants either by establishing regulations and installing traffic control devices where justified or by explaining to individuals why such regulations or devices cannot be approved. It it obvious that traffic engineers must be familiar with all sections of a city and must know the locations where efforts should be concentrated to reduce traffic accidents and to relieve traffic congestion. If funds are not available to effect immediate improvements at hazardous or congested locations, a traffic control plan or program must be developed to provide for necessary work on a priority basis.

Comprehensive city traffic surveys which have included traffic counts, accident analyses, and many other kinds of field studies generally have failed to improve local conditions. In most cases, over-all city surveys have required considerable time, usually several months or a year in larger cities, so that by the time the surveys were completed conditions had changed and traffic movements had varied sufficiently to reduce the value of the original factual data collected. Many city survey reports have been published and recommendations have been included for improvement work which would require the expenditure of large sums of money and long periods of time to complete. Obviously, it

Parking prohibitions on Main Street in Houston.

is much more desirable to investigate the most serious traffic problems first and attack those problems immediately. Long-range traffic plans certainly are desirable but they must be coordinated with other city plans, with proper consideration being given to financing methods.

The modern traffic engineering approach to the solution of local traffic and transportation problems recognizes the need for making the best possible use of existing street facilities and yet it does not overlook the desirability of developing plans for future improvements which require time and money to accomplish. Although the lack of curb and off-street parking spaces has produced a problem for practically all cities, the lack of accessibility to central business districts has also presented a big problem for traffic engineers. Particularly in the rapidly growing communities where there has been a great increase in the number of motor vehicles and in the use of automobiles, trucks and buses, traffic engineering controls have been a necessity.

Traffic Engineering In Houston

Traffic and parking problems in Houston have produced an unusual challenge to the Traffic and Transportation Department. Owing to the rapid growth in size and population of Houston and as a result of the inadequate planning of street and parking facilities to meet present-day traffic demands, motorists have accepted and conformed to many restrictive traffic and parking regulations which have not been acceptable in other cities. In particular, it may be pointed out that the one-way street system composed of over 22 miles of streets in the central business district, which became effective on February 8, 1948, affected the travel habits of all citizens. Through the cooperation of the police department and the application of adequate informative traffic control signs, motorists soon adjusted themselves to the new regulations.

In numerous cities, plans for one-way street regulations have not been adopted because of the opposition of retail merchants and of other special interests. By "pre-selling" the one-way street system in Houston, through personal contacts and meetings with representatives of various special interests, the Traffic and Transportation Department obtained the cooperation of individuals and organizations so that when the proposal for one-way streets was presented to City Council, it was adopted immediately. This type of selling traffic engineering plans and traffic and transportation con-

Gulf Freeway southeast from Houston.

trol problems is essential if cities are to benefit from the results of good traffic engineering work.

In order to be more specific regarding the nature of traffic engineering activities in Houston, examples of some of the traffic and transportation improvements which have resulted from traffic engineering surveys, investigations and plans will be cited.

The Gulf Freeway

The first section of Houston's Gulf Freeway, including the four-street distribution system, was opened to traffic on October 1, 1948, for a distance of 3.7 miles. When the Freeway is completed, it will extend on to Galveston. The value of the Freeway as a vital link in the general transportation system of Houston is generally recognized. Surveys by the Houston Department of Traffic and Transportation in 1949 revealed that the annual time savings for motorists who then used the Freeway but who formerly used old street routes in traveling to the central business district amounted to 106,234,240 vehicle minutes. The annual reduction in vehicle stops totaled 120,000,000. By assigning generally accepted monetary values to the time savings, it was estimated that motorists and operators of commercial vehicles were saving $2,688,684 per year. Construction and right-of-way costs for the completed portion of the Gulf Freeway then amounted to approximately $11,000,000. At the time of the survey, traffic volumes averaged 30,000 daily—the present daily traffic averages over 70,000 vehicles and economic savings are proportionately higher.

As a result of the construction and use of the Gulf Freeway, accessibility to the central business district of Houston has been improved and property values and business have been stabilized. Land adjacent to the Freeway, and other property which has been made more accessible to the Freeway, is being developed rapidly and values have increased from 200 per cent to 500 per cent.

Although State highway engineers who designed the Gulf Freeway gave careful consideration to all factors relating to requirements for moving large volumes of traffic safely and at relatively high speeds, the Houston Department of Traffic and Transportation was confronted with numerous traffic problems when the roadway was completed. It was necessary to determine the proper legal speed limit on the throughway section and on the service roadways, and arrangements were made for timing traffic signals to permit progressive movements of motor vehicles on the four-street distribution system. One-way regulations were adopted on the service roads, consideration was given to parking problems and to methods for prohibiting pedestrians from crossing the high-speed throughway section and many other related problems were solved.

Anticipated traffic volumes have been exceeded during each month since the opening of the Freeway. The throughway section provides for movement of vehicles in three lanes in each direction, with a 4-foot medial divider. Two service roads, one on each side of the throughway section, permit two lane movements of traffic in one direction. All street and railroad crossings are overpassed by the throughway section and access to the service roadways is limited. The four-street distribution system which connects with the Freeway provides for one-way traffic on the two inbound streets and on the two outbound streets. This distribution system is linked with the central business district by north and south major streets.

The Gulf Freeway has generated traffic and has relieved congested city streets. Many motorists travel as much as a mile out of their way in order to use the Freeway in traveling to and from the central business district because of time savings which are possible. Fortunately, the checkerboard system of north, south, east and west streets in the Houston central business district connecting with the four-street Freeway distribution system has provided adequate capacity to absorb the traffic from the Freeway. Through traffic engineering surveys, it was possible to determine traffic control and parking regulations which were needed to expedite the flow of traffic on city streets between the Freeway and the central business district. Undoubtedly, the adoption of one-way traffic regulations on the north and south streets which connect with the four-street distribution system represented the only feasible solution for the problem of providing capacity for movements of traffic between the central business district and the Freeway.

In planning for and in designing freeways similar to the Gulf Freeway, the advice and assistance of traffic engineers are needed. Owing to the fact that a freeway will permit heavy movements of traffic at high speeds, it is essential to relate the flow of traffic to the capacity of existing street systems and to the ability of street patterns to absorb freeway traffic. Traffic engineers should be called upon to conduct origin and destination surveys which will aid highway engineers in determining where freeways should be located and in planning for the capacity required to carry anticipated traffic volumes.

One-Way Street System

One-way traffic movements on the 22 miles of one-way streets in the central business district of Houston have favorably affected both accident records and traffic movements. Carrying capacity of the streets which were designated for one-way traffic was increased appreciably at relatively little cost. This result could not have been accomplished in any other way unless land and valuable business property had

been acquired to permit street widening. Conflicts at intersections were greatly reduced and traffic has moved more fluidly with fewer accidents. The cost of traffic control signs and markings and signal redesign and timing was less than $10,000 for the entire one-way street system.

Traffic volumes on the one-way streets, as compared with volumes prior to designation of the one-way system, have increased as much as 50 per cent. Traffic delays on all one-way streets are considerably less, varying from a reduction of 45 per cent on some streets to no delays on other one-way streets in traveling through the business district. The speed of traffic movements on one-way streets, as indicated by "before and after" surveys results, has increased from 14 per cent to 38 per cent even with the increase in traffic volumes on those streets.

Motorists, retail store operators and others affected by the one-way traffic regulations have indicated satisfaction with the system. Traffic surveys have revealed reductions in traffic congestion and delays as well as in traffic accidents. Pedestrian accidents at intersections have shown a considerable reduction.

Traffic Control and Parking Improvements

Restrictions in Turning Movements

Left turn movements which formerly interfered with the free flow of vehicular traffic have been eliminated at numerous intersections, particularly at signalized intersections along Main Street, in order to reduce intersectional conflicts. Right turns have been eliminated at several busy intersections on Main Street in the central business district in order to permit the uninterrupted and safe flow of heavy pedestrian and motor vehicle traffic. Objections to the restrictions in turning movements sometimes developed but motorists soon recognized the need for restrictions and adjusted their travel habits accordingly.

Curb Parking

Through the use of 3,500 parking meters, which have been located in accordance with curb parking demands and land use, a turnover of parking is provided and space is available for the short-time parker in the central business district. Less than 50 per cent of the total curb space is available for metered parking; however, because the remainder of the space is required for bus zones, truck zones and restricted parking spaces such as fire zones and no parking zones.

On a number of the heavily traveled one-way streets, parking has been restricted during the morning and afternoon peak traffic periods. By prohibiting parking on the right-hand side of inbound one-way streets in the morning and on the right-hand side of outbound one-way streets in the afternoon, during the times when traffic is heavy, an additional lane is provided for movements of buses and other motor vehicles.

Angle parking of motor vehicles has been prohibited, by city ordinance, at the curb throughout the entire city. (Although considerable progress has been made in eliminating cut-back curb parking spaces and angle parking in such spaces, this kind of parking still presents a problem.) All parking is prohibited at certain locations and at specified times. Parking is prohibited at all times throughout the day for individual automobiles on Main Street in the central business district.

Off-Street Parking

Several modern, multi-level off-street parking garages have been built in Houston since the end of the last war. Typical of these new facilities is the Foley's Store garage with a capacity of 800 cars, the Rice Hotel garage with a capacity of 1,000 cars, and the First National Bank garage with accommodations for 300 cars. State legislation does not permit the City of Houston to develop off-street parking facilities so it has been necessary for private enterprise and business organizations to provide off-street parking.

The present capacity of off-street parking facilities in the central business district of Houston is as follows: Garages, 4,750 spaces. Parking lots, 7,900 spaces. Total off-street parking spaces, 12,650.

Truck and Bus Zones

Based upon traffic engineering surveys, truck and bus zones have been established at the curb in the Houston central business district and in some outlying districts of the city. Truck loading and unloading is permitted on Main Street in the business district only between the hours of 6 A.M. and 10:30 A.M. Truck zones are provided in practically every block in the central business district, either in the middle of the block or where the greatest demand for loading and unloading operations are evident. Provision of adequate truck zones has eliminated the double parking of trucks.

Bus zones have been established on the basis of bus loading and unloading requirements at the curb. Surveys were conducted to determine the lengths of bus zones required to accommodate various numbers of buses. Both near-side and far-side zones are used, depending upon the direction of traffic movements on the cross streets. Near-side zones are not established if they would block a permitted right turn into a cross street. This practice is followed in order to eliminate conflicts between other motor vehicle traffic and buses when turning movements take place at intersections.

On Main Street in the central business district, bus zones are located in each block to provide for requirements of a shuttle bus which is known as the "Shoppers Special." This bus route has provided a desirable service for shoppers who travel between blocks in the business district. The Shoppers Special route extends on Main Street north and south for about one mile beyond the business district limits. Although fringe parking is not provided in conjunction with the north-south shuttle bus service, many motorists do leave their cars at the curb and use the shuttle service to and from the business district. A few months ago, an East-West Shoppers Special bus route was established in the central business district. This route connects with a small city fringe parking lot and also serves shoppers and persons transferring to and from the north and south bus lines. Operations to date have been on a trial basis but indications are that the bus route and parking lot will be operated on a permanent basis since results have been satisfying.

Bus Routing

In connection with Houston's one-way street system, 35 bus routes were revised and 12 bus routes were interconnected in the business district. Through the planning of routings, turning movements were reduced at intersections and bus service was expedited in the central business district and on other streets throughout the city. Over 6,000 daily bus turning movements were eliminated in the business district alone as a result of the new routings. More

acceptable and efficient service has been rendered for bus patrons because of the traffic engineering planning, which formed the basis for the new bus routings, and general congestion has been eliminated.

Traffic Signal Installations and Modernization

As a result of bond issues totaling $350,000, the Houston Traffic and Transportation Department during the past few years has been able to arrange for the installation of modern-type traffic signals at 135 intersections throughout the city. Additional intersections have been signalized during the past few months with $100,000 allocated from Street Improvement Bond Funds. Citizens have voted favorably on a bond issue of $500,000 for traffic signals so many more intersections will be signalized in the near future. Over 400 intersections in Houston are now signalized.

The Department of Traffic and Transportation has modernized numerous existing traffic signals and has retimed signals to provide for more efficient traffic movements. Careful consideration has been given to the interconnecting of traffic signals to provide for progressive movements of motor vehicle traffic and to installing traffic actuated signal controls where warranted.

Pedestrian Control

Safety education, police enforcement and installation of pedestrian control signals have produced excellent observance of vehicle signals by pedestrians in Houston. Previous surveys have indicated that more than 90 per cent of Houston's pedestrians observe traffic signal indications in the central business district and 85 per cent of pedestrians observe the signals at outlying intersections. Pedestrian "Walk" and "Don't Walk" signals have been installed at a number of signalized intersections to safeguard the lives of pedestrians and school children. Some pedestrian actuated signals have been installed.

Express Streets

The Department of Traffic and Transportation has been authorized by city ordinance to designate Express Streets throughout the city of Houston. After conducting various surveys and investigations, a system of 70 Express Streets was officially designated in December, 1948. Traffic investigations have been conducted on these Express Streets in order to determine where traffic regulations and traffic control signs, signals and markings were needed to improve the flow of traffic and to reduce traffic accidents. Traffic signals have been retimed and parking regulations have been adopted so that motor vehicles flow more efficiently on the designated Express Streets.

Traffic Control Signs and Markings

Uniform traffic control and parking signs have been in use in Houston for many years. A modern sign shop is operated by the Department of Traffic and Transportation and all signs are manufactured in the shop, using a silk screen process. Whenever traffic control or parking regulations are adopted, signs are installed to inform motorists regarding the regulations. All signs are maintained in good condition so that the respect of motorists is obtained with a minimum of enforcement.

Through the use of paint and plastic markers, center lines, lane lines, crosswalks and stop lines are maintained for the guidance of motorists. It has been found that channelizing or lane lines are most effective in producing the orderly movements of vehicles which increase the potential carrying capacity of streets. Adequate street markings have had a favorable effect upon accident records.

Handling Special Events

The Houston Department of Traffic and Transportation has frequently been called upon to assist in planning for the control of traffic movements and parking at times when special events are scheduled. Owing to the volumes of traffic developed at the times of football games, baseball games, parades and other events, special consideration must be given to moving motor vehicle traffic safely and efficiently and to the parking and storing of vehicles. The Traffic and Transportation Department, with the cooperation of the Police Department, has prepared plans for traffic and parking control at numerous special events in the past.

One of the largest crowds ever to assemble in Houston was noted on the night of the opening of the Rice Institute Football Stadium on September 30, 1950. Several weeks prior to that date, the Department of Traffic and Transportation conducted surveys and studies relating to the development of plans for moving motor vehicle and pedestrian traffic to and from the stadium and for the parking of thousands of motor vehicles adjacent to the stadium and at the curb on nearby streets. The stadium, which seats 70,000 persons, is located on the Rice Institute campus which is in a residential district where streets are relatively narrow. In order to move motor vehicle traffic, it was necessary to prohibit all parking at the curb on most streets within a one-quarter mile radius of the stadium and to prohibit parking on one side of practically all streets within a one-half mile radius.

Considerable parking space was provided in connection with the construction of the Rice Stadium (see front cover). A parking lot on the west side of the stadium, which provides space for 2,200 automobiles, is reserved for season ticket purchasers at a per game fee of $1.00. The public parking area east of the stadium, which handles approximately 8,000 motor vehicles, is open to the public at a 50c fee. A special reserved parking area at the south end of the stadium, which provides for 150 vehicles, is retained for official parking. At the north end of the stadium, there is a large area which provides for the parking of approximately 100 buses. Although a relatively large number of parking spaces is to be found immediately adjacent to the stadium on the Rice Institute property, those persons who cannot find parking space in these areas or who are unwilling to pay the parking fees have found it necessary to walk considerable distances to and from their parking spaces at the curb.

In connection with the planning for the control of traffic movements and parking at the opening of the Rice Institute stadium and at future football games at the stadium, traffic engineers worked out special traffic control regulations on streets and at intersections and prepared assignments for police officers who have assisted in handling motor vehicle and pedestrian traffic. As a result of advance planning and the installation of necessary traffic control and parking signs, there was little congestion or delay in the movements of vehicles prior to the opening game at the stadium and the parking areas were completely emptied within thirty minutes after the game ended. Experience gained in the handling of vehicle movements and parking in connection with the Rice Institute stadium has aided the Houston Department of Traffic and Transportation in handling large crowds at other special events since that time.

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Detroit Without Mass Transportation for 59 Days

By John J. Dobelek
Senior Associate Traffic Engineer, Traffic Engineering Bureau, City of Detroit, Michigan

WHAT happens when a vital segment of the transportation system in a large city is put out of operation? Are workers stranded and unable to reach their places of employment? Can the women get downtown to shop? What about accidents and congestion, do they increase or decrease and how much? What about parking, how is it affected? What can be done to improvise new transportation facilities? Detroit found some of the answers to these questions during the spring of 1951, when its mass transportation system was shut down completely for two months because of a strike. No buses—no street cars—nothing but passenger cars and trucks on the streets of Detroit for 59 days. Here is the background of the situation and the story of what happened during the walkout.

Mass transportation in Detroit is municipally owned and operated. The City Charter provides that a Board of Street Railway Commissioners acquire, own, and operate a system of mass transportation in a manner similar to that which ordinarily would be required of a privately operated system.

The Department of Street Railways, familiarly called "the D.S.R.," currently operates 400 street cars, 1500 motor coaches, and 100 trolley coaches about 250,000 revenue miles per day. These vehicles carried 1,800,000 passengers per day in 1944. During this war year, mass transit riding was at its maximum, while private passenger car traffic was at its lowest. Since 1944, transit riding in Detroit has decreased 34 per cent, while vehicular traffic has increased 71 per cent.

The Strike

The transit operators went on strike April 21, and returned to work on June 19, 1951. More than 1,000,000 daily passengers who normally depended on street cars and coaches were forced for 59 days to find other means of transportation, or to curtail their normal activities.

There was no indication, when the strike first started, that it would last more than a few days. Previous transit strikes, in 1941 and in 1946, each had lasted one week. During the early days of the strike, therefore, the principal emergency measure was to order all traffic officers on 12-hour duty. These police officers performed a tremendous task with outstanding success in controlling the abnormally heavy traffic at major intersections.

After a few days, it became apparent that negotiations between the transit operators and management were deadlocked, and that the strike was likely to continue for some time. Therefore, a series of emergency traffic control measures were put into effect at the beginning of the second week of the strike.

Fig. 1
Reversible lanes were used during the transit strike to increase directional capacity on several major thoroughfares.

Reversible Lanes Increase Directional Capacity

Perhaps the most successful of these measures was the use of reversible lanes on three of Detroit's principal streets. The reversible lane idea had been used successfully on Grand River Avenue since early 1947, and had resulted in a 34 per cent increase in peak hour volume on the very first day that reversible lanes were used. Figure 1 shows the reversible lanes in operation during the afternoon peak period. Periodic checks since that time have shown that the peak hour volume gradually increased to 3900 vehicles using 4 lanes in one direction on the street which had formerly carried only 2400 vehicles in 3 lanes. This successful increase in capacity on Grand River Avenue prompted thorough studies of other streets to determine if any would lend themselves to reversible lane operation. This study, made in 1948, revealed that the only streets which had suitable width and

sufficiently unbalanced rush hour traffic flow to warrant the reversible lanes also had double track street car operation and therefore were unacceptable.

When it became apparent that the transit strike was going to last more than a few days, the reversible lane system was put into effect on three of our most congested arteries. All three, Michigan, Woodward, and Gratiot Avenues, normally had two-way street car lines on pavements 80 to 90 feet wide. Portable signs reading "Keep Right—No Left Turn" were placed at frequent intervals to the left of the opposing street car lane. More than ordinary police supervision directed traffic in accordance with the signs. This system was used from 7 to 9 A.M. and from 4:30 to 6 P.M. The effects were startling. These three streets, which under normal conditions are badly congested, suddenly became free-flowing. The traffic congestion at several critical intersections which normally are badly tied up during rush hours, completely disappeared. Traffic on these three streets moved better during the transit strike than it ever had before as soon as reversible lanes were put into use.

The increase in traffic during rush hours on these streets was as follows: Michigan Avenue increased 52 per cent, from 1900 to 2900; Gratiot Avenue increased 35 per cent, from 2300 to 3100; Woodward Avenue increased 124 per cent, from 960 to 2147.

Despite these huge increases, traffic moved freely because the relative increase in capacity on two of the streets was greater than the increase in traffic. Woodward Avenue, which increased 124 per cent, was so intensively used by transit vehicles under normal conditions that it seldom was used to capacity. In addition, the Detroit Police Department performed a remarkable job in keeping traffic moving, and in keeping the minor flow out of the outside or "reversed" lane.

Trouble developed on one of these streets, Michigan Avenue, because the opposing direction of traffic had one less lane to use. This was particularly serious during the afternoon rush period. The opposing traffic, even under normal transit conditions, is so heavy that reversible lanes would not be practical on this street even if street cars were removed.

Effects of the Strike on Movement of Vehicles and Passengers

During the course of the strike, the Traffic Engineering Bureau was able to collect some interesting data. The value of this information was enhanced because it could be compared to certain traffic data that have been collected in Detroit at regular intervals over a period of several years. For example, once a month the 24-hour traffic volumes are counted at 26 different locations scattered throughout the city, and every second year a complete cordon count of vehicles and passengers is made in the Central Business District.

It was possible, therefore, to measure the effects of the transit strike with considerable accuracy insofar as the movement of vehicles and passengers was concerned. For example, the downtown cordon counts show that since 1944 the total number of people entering the Central Business District has remained essentially constant between 404,000 and 440,000 during a 12-hour period. However, the mode of transportation used by these people has changed. While in 1944 about 65 per cent of the people arrived in D.S.R. street cars and buses, this had dropped to 47 per cent in 1950. On the other hand, it has been found that less than one-third of industrial employees use mass transportation facilities and about two-thirds ride in private automobiles.

The maximum possible effect of a transit strike on reducing the number of people entering the Central Business District, therefore, could have been a reduction of 47 per cent. This reduction would have occurred if all transit riders had remained home, and if each private vehicle carried the same number of persons as before. As would be expected, neither of these two things happened. People continued to come downtown by either driving their own car which normally would be left at home, or by riding with friends and neighbors, or by hitchhiking. Eight-hour counts made at the downtown cordon boundaries showed the following increases in all types of vehicles over 1950:

Michigan Avenue	increased	32%	over	1950
Grand River Avenue	"	32%	"	"
Woodward Avenue	"	64%	"	"
Gratiot Avenue	"	35%	"	"
Jefferson Avenue	"	37%	"	"

Normally, 117,700 passenger vehicles and 5,658 transit vehicles enter the downtown area during a 12-hour period. During the transit strike, the number of passenger vehicles increased to 153,000, an increase of 30 per cent or 35,300 cars. Therefore, every transit vehicle entering the downtown area under normal conditions was replaced by 6.2 private passenger cars during the strike.

The number of persons per automobile entering the downtown area in 1950 was 1.6. This increased to 2.24 during the strike. From these observations, it was calculated that 342,000 people entered the downtown area during the strike, compared with the normal 404,000, or a reduction of 15 per cent.

The increases in traffic volumes and vehicle occupancy ratios were 8-hour averages. It was noted that these increases were greater before 9 A.M., and of course, less than the averages after 9 A.M. It was evident, therefore, that employees were arriving to work in normal numbers, and that practically all of the 15 per cent reduction in the number of people coming downtown was after 9 A.M. The reduction, therefore, was to a large extent in the number of shoppers. The reduction in shoppers was observed particularly at one intersection which is considered the focal point of pedestrian and shopping activity. It is also an important transfer point for three heavy transit lines. The number of pedestrians using one crosswalk at this location between 11 A.M. and 4 P.M. dropped from a normal of 28,000 to 12,000, a reduction slightly more than 57 per cent.

Effects on Business

The immediate effect on downtown business during the first days of the strike was considerable. Some stores reported up to 50 per cent reduction in business. As the strike wore on, however, shopping methods and travel habits changed. As one newspaper stated, downtown stores turned into mail-order houses, and telephone numbers loomed larger in their ads. As the strike continued, the reported loss in business grew smaller and smaller. When the strike ended, the Detroit Board of Commerce announced that retail business during the strike was less than 10 per cent under the volume of business for a similar period during the previous year. Even this 10 per cent cannot be definitely attributed to the absence of mass transportation for a similar decrease

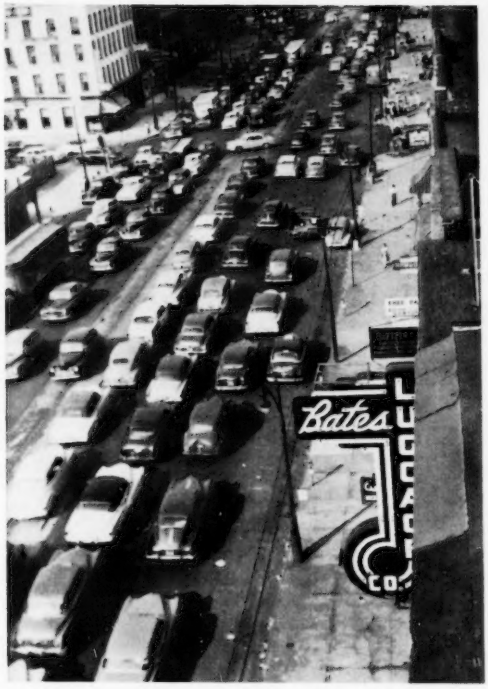


Fig. 2
Congestion was prevalent on many city streets during the strike.

was evident in most of the larger cities throughout the country during the months of the strike.

In industry, the strike caused a sharp increase in absenteeism the first day. However, since only one-third of Detroit's industrial workers rely on mass transportation and are old hands at sharing rides, factory absenteeism was practically normal by the third day.

Perhaps those most affected were the old folks, the handicapped, and students in certain schools whose enrollment was scattered over wide areas of the city.

Traffic Accidents and Congestion

Traffic accidents naturally increased during the strike. Comparing the month of May, 1951, with May, 1950, fatal accidents increased 11 per cent, injury accidents increased 26 per cent, and non-injury accidents increased 60 per cent. During comparable periods, traffic volumes at 24 different locations increased an average of twelve per cent. However, Detroit's accident experience has been increasing at a rate faster than the increase in traffic volumes for the past three years, so that the large increases in injury and property damage accidents cannot be entirely attributed to the transit strike.

The use of reversible lanes on certain streets had startling results in relieving congestion. However, this could not be done on other principal thoroughfares and congestion, illustrated in Figure 2, was the rule. Many of them have been loaded to capacity for years, and the additional traffic created serious problems. This was especially true in the downtown area, which experienced the greatest increases in traffic but where little could be done to increase street capacity.

Parking During the Strike

The influx of private automobiles naturally created a terrific parking problem, especially in the downtown area. All parking restrictions were suspended at the beginning of the strike except those prohibiting parking or standing during the rush hours. Motorists were permitted to park in spaces normally reserved for bus stops or bus layover points, and adjacent to unprotected street car loading zones which normally are cleared of parking. The lifting of time-limit restrictions also applied to parking meters. An amazing number of motorists were able to pick out of the newspapers an announcement—which occupied not more than one-half inch of column space—that they could park all day at a meter without depositing a coin. The very first day after the announcement practically every metered parking space in the city was occupied by an all day parker. The only exceptions occurred on streets where parking was prohibited during the morning and afternoon rush hours. Since the average all day parker arrives before the morning rush hour ends, and leaves after the evening rush hour begins, he did not park on this type of street.

Other changes were made to provide more temporary parking space in the downtown area. Two parallel rows of parking were permitted in the center of two wide streets which carried relatively light traffic. As shown in Figure 3, angle parking was permitted at the lower end of Woodward Avenue, which normally serves as a turnaround and layover area for several coach lines and one heavy street car line. The most important single change in the downtown parking situation was the temporary surfacing and use for parking of a two-square-block area that had previously been cleared of buildings in preparation for the construction of the new City-County Building. A temporary surfacing and grading job was completed in about 2 days and the entire area turned over to parking for the duration of the strike. This lot had a capacity of 550 cars. The parking fee was a flat 50 cents regardless of the length of time parked. During the strike, it was filled to capacity each day by 9:30 or 10 o'clock in the morning, and potential customers were turned away the balance of the day. See Figure 4.

The changes in parking regulations, the permission to angle park on Woodward Avenue, and the use of the City-County Building site for parking added about 1,000 parking spaces in the downtown area. In addition, commercial parking lots were permitted to jam their lots beyond their licensed

Fig. 3
Several lightly traveled streets were literally turned into parking lots during the strike.

Fig. 4
A two-square-block area where a new building is to be constructed was temporarily converted into a 550-car parking lot during the transit strike.

capacity. Needless to say, every available nook and cranny in the downtown area was used for parking.

It should be noted that the relaxation of time-limit parking controls, the rate structure of the temporary municipal parking lot, and the permission to angle park, all tended to favor the all day parker at the expense of the short-time parker. There was some undercurrent of discussion of this policy, mostly from the standpoint of the loss of parking meter revenue. This policy, however, enabled more persons who worked in the downtown area to use private automobile transportation with some chance of being able to park. Shoppers and other short-time parkers were, of course, penalized by this policy.

Results of the Strike

From the graph shown in Figure 5, it is evident that the strike has had considerable effect on the volume of passengers carried on the D.S.R. Four months after the end of the strike, D.S.R. revenue passengers were 19 per cent below what they were prior to the walkout. Since the end of the war, there has been a general increase in street traffic and a corresponding decrease in mass transit passengers. During 1950, however, these trends seemed to be leveling off somewhat. Stabilization is particularly evident in the D.S.R. passenger curve during 1950 and it seemed to be continuing during the first three months of 1951. This would indicate that the number of revenue passengers during 1951 probably would have equalled the number during 1941 if there had not been a transit strike. The sharp drop which occurred at the termination of the strike can be partially attributed to the fact that Detroit unemployment increased during the strike because of factory conversions from civilian to military production. However, some portion of this sharp decrease must be attributed to new riding habits formed during the 59 day strike by many regular transit riders. Only time will tell how permanent these new riding habits are.

One of the more significant results of this 59 day transit strike is that Detroit traffic officials had a preview of traffic conditions as they may exist in another five years if no improvements are made. Detroit had a week-long transit strike in 1946 during which traffic was badly snarled. During the 5 years since that strike, normal everyday traffic volumes had increased to the level reached during the 1946 strike. The normal congestion on many Detroit streets in 1951 is equal to that experienced during that strike 5 years ago.

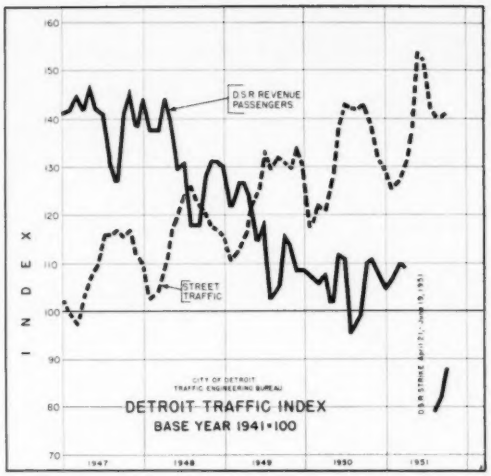


Fig. 5
Trends in Street Traffic and Transit Passengers.

If traffic during the next 5 years keeps increasing at the current rate, the streets in 1956 may look exactly like they did during the strike this spring.

The only way to forestall such conditions is to use the existing streets as efficiently as possible, and to build new capacity. Detroit now has three miles of modern expressway, and hopes to open an additional two miles next year. In the next 4 years, we plan to have one expressway completed crossing the city in a north-south direction and another crossing the city in an east-west direction. In the meantime, every means at our disposal is being used to increase the efficiency of our present street system.

The strike also provided a preview of what parking conditions in downtown Detroit may be like in the future. Even under normal conditions, it is estimated that an additional 10 thousand parking spaces are needed. The Municipal Parking Authority has been working on a parking program for downtown Detroit for several years but has been handicapped by opposition from private interests who are opposed to the establishment of municipal parking facilities. It is hoped that the State Supreme Court will rule in favor of the city on several important legal questions regarding parking so that real progress can be expected in the near future.

Little Change in Traffic Speeds On Rural Roads

The average speed of motor vehicles on main rural highways during 1950 was 47.6 miles per hour, the same as for 1949, according to the Bureau of Public Roads. Speeds by type of vehicle classified by passenger cars, trucks, and buses, were also approximately the same for the two years.

Twenty-eight states reported the results of 819 speed studies conducted on main rural highways during 1950, including observations of 279,719 vehicles.

The Behavior of Drivers at Uncontrolled Intersections

By Wolfgang S. Homberger*

THIS study was undertaken to obtain more information on the behavior of drivers at uncontrolled intersections. The intersection studied was located in a downtown area, and carried about 1200 vehicles per hour, distributed fairly evenly between the two streets. Data were obtained by means of a motion picture camera, which filmed all traffic for 100 feet along each leg of the intersection.

The purpose of the study was to supplement a similar study by Greenshields, Shapiro and Ericksen, made a few years ago for the Yale Bureau of Highway Traffic.[1] It was also of interest to investigate if there is any basic difference between the behavior of California drivers and that of East Coast drivers.

Specifically, information was sought on the following three points:

1. The conformance of drivers to expected behavior, and the variation of this conformance with distance from the point of conflict.
2. The effect on the behavior of drivers of the section of the vehicle code which demands that in cases of close conflict the driver on the left shall yield the right-of-way to the driver on the right.
3. The location of the point or area of decision, as determined by variations in the speed of preceding drivers, and the variation, if any, of this point or area for fast, medium, and slow drivers.

Definitions

The following terms are used frequently in this report, and are defined herewith:

Point of Decision—The point, or approximate point, at which a driver decides whether to precede or yield to a car conflicting with it.

Expected Behavior—A car having time or distance advantage may be expected to precede an opposing car, which has similar disadvantages. Thus, a car preceding with advantage conforms to expected behavior; a car yielding with advantage does not conform.

Potential Time to Point of Conflict—The time required by a car to travel to the point of conflict from its momentary position, if it continues at its momentary speed.

Time Advantage or Disadvantage—The difference in potential times to the point of conflict between two cars converging on such a point. The car with the shorter potential time is said to have the advantage, the car with the longer time has a disadvantage of equal magnitude.

Entrance Time Advantage—This term, not to be confused with the one immediately above, is used in this study to mean the number of seconds by which one car precedes another conflicting car into the intersection. The entrance to the intersection is the extension of the curb line.

Distance Advantage and Disadvantage—The difference in the distance of two cars at any moment from the point of conflict. The car closer to the point of conflict is said to have the advantage; the car farther away has a disadvantage of equal magnitude.

Equipment and Location

Data for this project were obtained by means of motion picture films. A 16-mm Eastman Cine Kodak camera was used, and was mounted on a tripod together with an intervalometer. This latter instrument consists of a synchronized motor which rotates a cam. This cam moves a lever attached to the single-exposure mechanism of the camera. Three cams are available, making possible rates of exposure of 44, 88 and 176 frames per minute. All film taken in this project was exposed at the rate of 88 frames per minute.

The selection of the intersection for this study was based on the following requirements:

(a) No signals or STOP signs.

(b) Two two-way streets of approximately equal volumes, these volumes to be high enough to give a large sample in a short time.

(c) Minimum interference from pedestrians and bus stops.

(d) The availability of a photographic vantage point, which meets the requirements referred to below.

The last requirement turned out to be the most difficult one to meet. To make an effective analysis, at least 100 feet of each leg of the intersection has to be photographed. In a built-up area, this is generally impossible. It was found that from the photographic requirements, the intersection had to have at least one completely clear corner, behind and above which the camera could be placed. It was also found from sample film taken at three intersections that, while close-up shots would result in greater accuracy in analysis of the film, a distance of at least 300 feet would be required, so that the picture would include not only the two near legs, but also be at favorable angles for looking down the far legs.

A number of intersections in Oakland and downtown San Francisco were studied for selection for this project. After study of the sample film, it was found that only the intersection of Webster and 13th Streets filled all the re-

*Mr. Homburger was a student at the Institute of Transportation and Traffic Engineering, University of California, during the academic year 1950-1951, and this study was carried out as part of his graduate work leading to the degree of Master of Engineering.

[1]Greenshields, Shapiro and Ericksen. *Traffic Performance at Urban Street Intersections*. Yale Bureau of Highway Traffic. 1947.

quirements listed above. This intersection is completely uncontrolled, and has approximately equal volumes from three of the four legs. In a four-hour automatic count (11 A.M. to 3 P.M.) the following approach volumes were recorded:

	Average Hour	Maximum Hour
From North:	401	446
From East:	288	320
From South:	244	280
From West.:	253	272
N-S Total:	645	700
E-W Total:	541	585

Pedestrian movement was considerable, but no better intersection could be found, and so this factor had to be ignored. It was discovered in the analysis that a number of cars had to stop to yield the right-of-way to pedestrians. This reduced the size of the sample which could be analyzed.

The camera was located on the 17th floor setback roof of the Financial Center Building, on Franklin Street, between 13th and 14th Streets in downtown Oakland. The building is actually just over a block from the intersection under study; however, the intervening block is a parking lot, and presents no obstruction to a clear view of the intersection. From the position of the camera the horizontal distance to the center of the intersection was about 425 feet, the vertical distance was 203 feet.

A specially adapted Keystone Movie Projector was used to analyze the film. To locate the position of various vehicles, a grid was drawn on the screen. One hundred foot ordinates were placed 5 feet from the centerline of the roadways, and the ordinates were then laid outwards from these. The location of points of conflict between two cars was defined by these ordinates to the nearest 5 feet only. For instance, a Northbound car interfering with an Eastbound car could have one of three points of conflict, from the point of view of the latter: If the Northbound car was traveling in the center lane, the conflict was at ordinate value 110; if he was in the outside lane, the conflict was at value 120; if he was straddling the two lanes, the conflict was at value 115. Similarly the point of conflict is located from the point of view of the Northbound car, and determined by the lane of travel of the Eastbound car. It can occur at values 100, 95, or 90.

With the grid established, the film was run slowly through the projector until a close conflict between two cars moving at right angles was observed. Conflicts involving a turning car, a car following so closely behind another as to be affected by it, or a car which was impeded by pedestrians were omitted. When an acceptable conflict was found, the film was reversed to the point at which both cars had entered the grid. Their position was then read and recorded on every frame until the first car had crossed the point of conflict.

Data

The data used in the following analysis were obtained from 84 distinct conflicts, although the same car may have been involved in two conflicts. For each conflict a number of time and distance advantages could be obtained. This number varied according to the number of frames during which both conflicting cars were within the grid. This accounts for the fact that there are 385 close cases tabulated in Table 1.

TABLE 1
CONFORMANCE OF DRIVERS TO EXPECTED BEHAVIOR

Distance of Car From Point of Conflict	Number of Close Cases Recorded		Conformance to Expected Behavior: Time		Conformance to Expected Behavior: Distance	
	Preceding	Yielding	% Preceding With Advantage	% Yielding With Disadvantage	% Preceding With Advantage	% Yielding With Disadvantage
ft						
0-9	34	1	100	100	100	100
10-19	62	14	98	93	92	36
20-29	66	36	89	89	89	69
30-39	57	58	91	86	82	72
40-49	41	57	76	84	76	72
50-59	41	53	76	87	71	75
60-69	31	50	81	86	61	76
70-79	23	46	65	85	52	94
80-89	24	45	71	78	46	87
90-99	7	25	57	88	43	100

A glance at Table 1 will show that the number of close cases recorded is very low for yielding cars within 10 feet of the point of conflict, and for preceding cars close to the outer ends of the grid. This is due to the fact that data is recorded only from the moment at which *both* cars are within the grid to the moment when the preceding car crosses the point of conflict. It is only on very rare occasions that the yielding car is within 10 feet of the point of conflict when the preceding car crosses it; hence only one such case is found in the tabulation. On the other hand, the preceding car is usually already with in 89 feet of the point of conflict by the time the yielding car enters the grid.

In explaining the nature of the data, it must be mentioned that all yielding cars 90-99 feet from the point of conflict will probably have distance disadvantages; if they have not, the preceding car is probably outside the grid, and the position is not recorded. This explains the fact that Table 1 shows all yielding cars at 90-99 feet to have distance disadvantages, whereas it might be expected that the correlation would be much less.

Analysis

A car having an advantage (time or distance) with respect to a conflicting car may be expected to precede, while a car having a disadvantage may be expected to yield at the point of conflict. Conformance to this behavior will vary according to the distance from the point of conflict. Without any data or proof, one might intuitively expect the following:

Close to the point of conflict, cars with advantage will almost always precede, and cars with disadvantage will almost always yield; i.e., conformance to expected behavior near the point of conflict is close to 100%. The farther a car is from the intersection, the less likely it is that this rule will be followed. However, it should not break down altogether, and it is fair to assume that at a point far enough away from the intersection conformance should approach 50%; i.e., a car with advantage is as likely to precede as yield, provided that the conflict is a fairly close one. Thus all four conformance columns *should* show a trend from 100% in the 0-9 foot range toward 50% in the outer ranges.

There are, actually, three types of advantage which might be considered. Time and distance advantages have already been defined; similarly the concept of speed advantage might be developed. It is felt that time advantage, since it combines the effect of speed and distance, is superior

to both the other concepts. When making a decision at an intersection, a driver cannot do so solely on the basis of his position, or solely on the basis of his speed relative to a conflicting car. It is the combination of the two which determines his action.

It might perhaps be argued that distance plays no role in the decision at all. This, however, is only applicable within close limits. An analysis of speed advantages would be very misleading and give a poor representation of actual behavior. A car may be crossing the point of conflict at 5 mph, while another one is approaching it at 20 mph, but still 100 feet away. The slow car is preceding (as could be expected) with a speed disadvantage of 15 mph. This statement suggests abnormal behavior, which would therefore be misleading.

The trend for preceding cars shown by Table 1 is as would be expected. Both for time and distance advantage, 100% conformance to expected behavior is found near the point of conflict, and conformance drops off to the neighborhood of 50% at a distance of 90-99 feet. It may therefore be accurate to say that conformance to expected behavior does approach 50% as the distance from the intersection increases.

The trend for yielding cars is distorted due to the nature of the data. Omitting the 100% figure in the 0-9 foot range (since it is based on only one sample), the conformance, in respect to *time* disadvantage, remains almost constant at a little below 90%. In the *distance* disadvantage column, the trend is distorted to the point that it is actually reversed, rising from 36% conformance at 10-19 feet from the point of conflict to 100% when 100 feet away.

The distortion can be explained by the manner in which the data were obtained. The yielding cars in the upper ranges—say over 70 feet—have more chance of being recorded if they have a time and/or distance disadvantage. A yielding car having an advantage at 70-100 feet may not be recorded, because the conflicting car has not yet appeared on the grid. Similarly, a yielding car at, say, 10-29 feet from the point of conflict has a much greater chance of being recorded if it is at an advantage; for, if it is at a disadvantage, the preceding car has probably already crossed the point of conflict, and the position is again not recorded.

Thus the tendency is to record only those yielding cars close to the point of conflict which have an advantage, and those at the outer ends of the grid which have a disadvantage.

Effect of the Rule of Right-of-Way

The Vehicle Code of the State of California provides that, when two vehicles enter the intersection at about the same time, the one on the left shall yield the right-of-way to the car on the right.

During the progress of this study it was suggested that the data could be used to see whether this rule has any appreciable effect on the behavior of drivers. The following analysis was therefore made:

It was recorded at what frame time each car of a closely conflicting pair entered the intersection (i.e. crossed the curb line). Such data could be obtained for only 39 of the conflicts. It was then recorded which car entered first, and how many seconds before the second car, and which car preceded. In the 39 cases, the car on the right preceded 24 times (62%), and yielded 15 times (38%). A breakdown of the data (Table 2) shows that the cars from the left never preceded if they entered the intersection more than 0.25 seconds after the car from the right. Cars from the right, however, preceded when they entered the intersection last by as much as 2.05 seconds.

This sample, though small, shows some significant trends, and further tests of this nature should prove of great interest. Such tests should be made in various states, having different right-of-way rules, and the results compared.

Judging from the sample tabulated in Table 2 the rule does have an effect on the behavior of drivers at uncontrolled intersections. Assuming that the term "at the same time" might mean up to about one second difference, for conformance to the rule all cars from the left which preceded should have time entrance advantages of 1 second or more, while cars from the right might have time advantages of any value, and disadvantages up to 1 second. In this sample, about 80% of the cars from the left and 90% of the cars from the right obeyed this rule. In the closest cases—when the cars entered within 0.75 seconds of each other—the car from the left preceded 3 times (21%), the car from the right 11 times (79%). Thus an 80% conformance to the law is indicated.

TABLE 2

ENTRANCE TIME ADVANTAGE OR DISADVANTAGE OF PRECEDING CARS

Amount of Entrance Advantage ( ) or Disadvantage (—)	Cars from Left			Cars from Right		
	No.	%	Cum. %	No.	%	Cum. %
Over 2.25 secs	6	40	40	1	4	4
2.25 to 1.75	1	7	47	3	13	17
1.75 to 1.25	2	13	60	1	4	21
1.25 to 0.75	3	20	80	5	21	42
0.75 to 0.25	1	7	87	2	8	50
0.25 to —0.25	2	13	100	5	21	71
—0.25 to —0.75	—	—	100	4	17	88
Over —0.75 secs	—	—	100	3	12	100

Point of Decision and the Approach Speeds of Vehicles

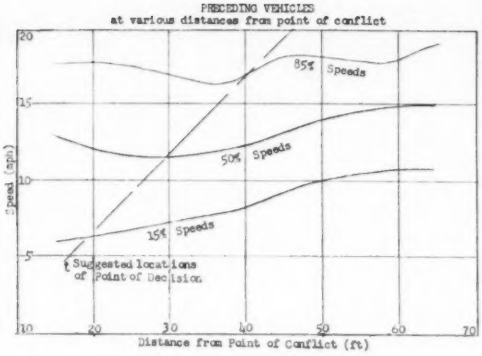
The data obtained from the film were also used to analyze the speeds of the vehicles involved in close conflicts. Again it must be pointed out that the data is somewhat biased toward the slower vehicles. For instance, a car traveling through any 10-foot range at 5 mph will be recorded twice, while another traveling at 10 mph will be recorded once, and one moving at 20 mph has a 50% chance of not being recorded at all in that range.

The data were analyzed only for cars between 10 and 69 feet from the point of conflict. Cumulative percentages were calculated, and the 15th, 50th, and 85th percentile speeds were plotted in Figure 1.

The figure shows trends which were to be expected. For preceding cars, there is little change in speed. However, such changes as there are, are very significant. The faster cars slow down a little to a point about 25-35 feet from the point of conflict, the lower 15% continue to slow down a little. When they are certain of the fact that they can precede, they pick up speed again.

As might be expected, the yielding cars show a steady decline in speed as they near the point of conflict. Also, all the speeds of the yielding cars are less than the corresponding speeds of the preceding cars. This is an indication of the importance of speed in the decision of a driver whether to precede or yield.

It is believed that the speed curves for preceding cars give a valuable clue as to the location of the point or area of conflict. There is evidently a point of minimum speed for these cars, before they decide to precede, and the de-



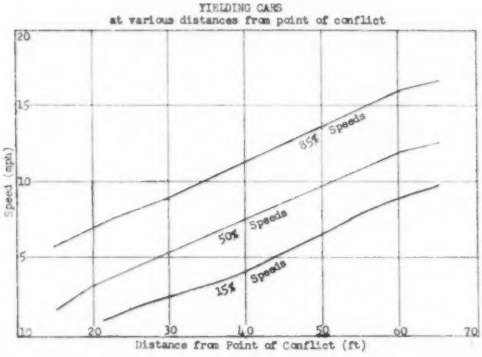


FIG. 1. COMPARISON OF SPEEDS AT VARIOUS DISTANCES FROM POINT OF CONFLICT

cision is probably made near this minimum point.

It would seem from the upper part of Figure 1, that the point of decision varies with the speed—or perhaps aggressiveness—of the driver. Assuming the point of decision to lie just before the minimum speed, it can be seen that for the 85th percentile drivers the point of decision lies about 40 feet from the point of conflict, for the 50th percentile driver it is about 30 feet away, and for the 15th percentile driver it is less than 15 feet away. The broken line in the figure indicates the location of the area of conflict for various speeds as suggested by the author.

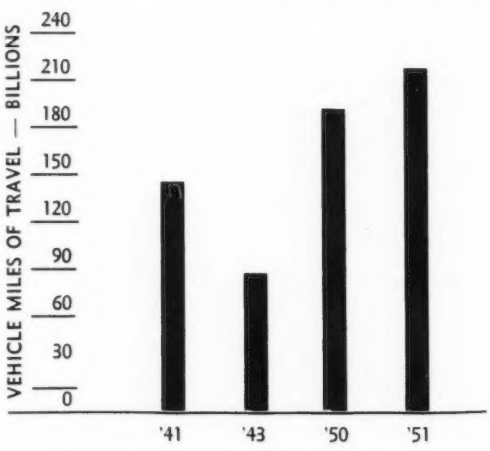
This method of obtaining an approximate location for the point of decision may prove to be a very reliable and valuable one, and may lead to a number of interesting studies. Points of decision for fast, medium and slow drivers may be obtained for different conditions of sight distance, traffic volumes, turning volumes, etc. For such a study, cars which do not actually conflict may well be included, or studied separately, since they do not know until a certain point near the intersection if there is any cross conflict or not.

The speed curves for yielding cars do not indicate any point of decision. However, since the point of decision is defined as the point at which the driver makes up his mind, it can be stated that the point of decision for yielding cars must be at about the same location as that for preceding cars. Until the point of decision all cars are still potentially both preceders and yielders. Only the human factors—aggressiveness on the part of the preceders, and timidity on the part of the yielders—may cause the point of decision for the yielding group of cars to be shifted farther away from the point of conflict.

Conclusions

1. The conformance of drivers to expected behavior was found to vary from 100% close to the point of conflict to about 50% at a distance of 100 feet. This trend was definitely established for preceding cars, and is expected to be found for yielding cars, if unbiased data can be obtained.
2. The rule of right-of-way in effect in the State of California probably has a significant effect on the behavior of drivers. The rule seems to be observed in about 80% of the cases in which it applies. However, the data for this test are not of sufficient quantity to allow much reliance to be placed on this result.
3. The point of decision of approaching cars varies with the relative speed of the vehicles. It is farther away from the point of conflict for the faster vehicles than for the slower ones. At the intersection studied, the difference between the locations of the points of decisions for the 85th and 15th percentiles drivers was more than 20 feet.
4. In general, there was agreement between this study and the one made several years ago by Greenshields, Shapiro and Ericksen. However, instead of 50% conformance at a distance of 100 feet from the point of conflict Greenshields obtained 0% conformance (from only 2 samples). Difficulties encountered by Greenshields in analyzing behavior of yielding drivers were also evident. The samples obtained by his method of analysis resulted in bias at the two extremes of the tabulation.

Traffic Trends



TRAVEL ON RURAL ROADS FOR FIRST TEN MONTHS of 1941, 1943, 1950 and 1951.

Based on Bureau of Public Roads Data

Parking Policy for Milwaukee

From Information Supplied
By Howard F. Ilgner
Traffic Engineer and Superintendent, Bureau of Electrical Service, City of Milwaukee

MILWAUKEE, possibly unlike a good many cities, has in addition to the central retail business district, a number of other business districts, complete with a first-class department store or retail stores of the same caliber as the best in the Downtown Area. When off-street parking was discussed for the Central Business Area, there was immediately a flood of requests sponsored by outlying business associations and their aldermen for the establishment of off-street parking facilities in these areas, on the basis that the city would pay all expenses in connection with the establishment and operation of these off-street parking facilities and that they were to obtain free parking.

The Interim Parking Commission and the Comptroller of the City of Milwaukee felt that such a policy would be ruinous and after considerable study and discussion, recommended the Nine Principles enumerated in the following common council resolution on Parking Policy for the City of Milwaukee:

PARKING POLICY RESOLUTION

MILWAUKEE CITY COUNCIL

WHEREAS, The Common Council of the City of Milwaukee has been requested to establish off-street parking facilities in the downtown and many of the outlying business areas; and

WHEREAS, It is imperative that all areas of the City be accorded fair and uniform treatment in the consideration of such proposed off-street parking facilities; now, therefore, be it

RESOLVED, By the Common Council of the City of Milwaukee, that the following principles will be applied in the financing of all municipally-sponsored outlying and downtown off-street parking projects:

1. Whenever and wherever possible, private businessmen will be encouraged to create and to operate parking facilities entirely with their own capital. In cases where such businessmen are unable to buy the desired land at a fair price, the City may acquire the land and lease it to them for an annual rental sufficient to cover all costs incurred by the city.

2. *General taxes will not be expended to acquire, improve, or operate parking lots in any area.*

3. It will be a matter of policy that the Common Council will not consider any requests for off-street parking facilities unless the merchants and property owners in the area concerned agree to having parking meters installed on the business streets involved. If possible, such meters should be installed well in advance of the time when land is to be acquired for the proposed lot or structure.

4. A charge will be made for parking on all municipally-sponsored lots so that a revenue will be yielded. Revenues will be obtained in one of the following ways:

a. By installing parking meters;

b. By leasing the facility to a private operator who in turn will collect parking fees; or

c. By hiring City attendants to collect fees (can only be legally used in cases where suitable lease cannot be negotiated).

5. Revenues from the off-street facilities and the street meters in each area will be used to cover operating and replacement costs and as large a percentage of land acquisition and improvement costs as possible.

6. The portion of land acquisition and improvement costs that cannot be financed from the above-described revenues will be covered from benefit assessments on nearby properties that are zoned for business if corresponding benefits are created.

7. No municipally-sponsored business area parking lot will be installed unless it can be expected that all costs can be paid from the revenues and benefits assessments collected in that business area.

8. The benefit to the general taxpayer, derived because parking lots maintain property values and have favorable effects on traffic, calls for a small contribution from the City as such. The City, therefore, will exempt these lots from all property taxation, will furnish the "know-how" of its officials and technicians, and will use its condemnation powers, if necessary, to acquire land at fair prices.

9. As provided by Resolution File Number 50-160-a (adopted June 20, 1950), the Kline Law (Chapter 275 of the Laws of 1931 as amended) will be used for the land acquisition and construction of initial improvements on off-street parking facilities "so that land will be purchased at fair prices and full knowledge as to benefits and damages will be available to the Common Council."

This resolution was adopted by the Common Council on June 29, 1951 and is known in Milwaukee as Common Council File Number 50-3347—"to govern establishment of off-street parking facilities in both downtown and outlying areas."

No off-street parking facilities have actually been established under this File Number but several in the outlying areas and several in the Central Area are under consideration. It is the general purpose of the resolution to encourage private businessmen to create and operate parking facilities entirely with their own capital. In cases where such businessmen are unable to buy the desired land at a fair price, the City may acquire the land and lease it to them for an annual rental sufficient to cover all costs incurred by the City.

The adoption of these principles by the Common Council was followed by a very considerable demand for the installation of parking meters. Meters have proved very popular but have dampened considerably the demand for off-street parking facilities in some areas when it was seen how much curb parking space was available for short-time parking after the parking meters were put in operation.

If the estimated revenues from the off-street parking facilities and the street parking meters in the various areas

are not sufficient to cover land acquisition and improvement costs, it is stipulated that such costs will be covered from benefit assessments on nearby properties that are zoned for business as corresponding benefits are granted. These benefit assessments have caused very considerable opposition in one of the areas under consideration—especially from those property owners who own, and in some cases, operate parking lots and those engaged in businesses which will not be greatly benefitted or which they *claim* will not be greatly benefitted by such off-street parking facilities.

This has led to a suggested amendment to Principle No. 6 which reads as follows:

> As an alternative to paying these benefit assessments, the benefited businessmen, property owners, and other interested parties may elect to subscribe for revenue bonds in an amount equal to that which would otherwise be raised from benefit assessments. It shall be provided, however, that such revenue bonds will not be an obligation of the City of Milwaukee, that principal and interest on such bonds will be paid only from revenues collected and that such principal and interest will not be paid until such time as all operating, land acquisition, and improvement costs to be paid from these revenues have been paid.

This amendment has not been passed up to the present time.

The fact that no parking facilities have been established under File Number 50-3347 does not mean that the city has not contributed toward the alleviation of the parking situation. City-owned land with a capacity of 3,701 cars has been leased out to private operators who are operating these lots for parking purposes. In addition to this the city is operating one parking lot on an experimental basis with parking meters in a local business area, but not under this particular file number. Also, in connection with parking requirements for city buildings and city operations, parking lots with a capacity of 267 cars have been provided.

(Continued from page 95)

Conclusion

The foregoing listing of the responsibilities involved in the various phases of the traffic enginering and highway planning functions, reveals the large areas in which the two fields coincide. While there are manifestly differences between them, they are nevertheless closely related facets of the same endeavor. Basing their operations on similar and often identical data, they use different methods to achieve a common objective—more efficient and safer highway transportation.

State highway agencies differ as to whether the planning and traffic functions should be geared to their operations as one organization or as separate units. In Michigan we have found that combined they can provide the highway administrator with assistance throughout practically every phase of his responsibility to highway transportation.

Planning provides the basic information and the general plan for programs of highway construction and improvement. When the highway has been built, traffic engineering sees to it that it is used safely and efficiently; and as the road grows old, the traffic engineer devises means for serving and protecting traffic until adequate facilities can be provided. In the meantime, both the planning and the traffic engineers have been observing and recording the facts and characteristics of road usage which must be incorporated into the plans for the new highway.

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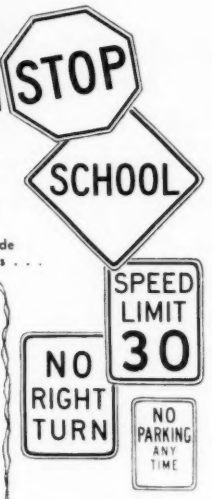

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(Continued from page 100)

Conclusions

The examples of traffic engineering practices in Houston reveal the possibilities for improving traffic and parking conditions in other cities. Large sums of money will be required to reconstruct obsolete roadway systems because it is evident that this is the only permanent cure for traffic problems. Additional freeways must be built to move anticipated heavy volumes of traffic and to maintain and stabilize central business districts and other property within urban areas. More stringent traffic and parking restrictions may be expected on existing street systems.

In consideration of the future traffic problems which will increase in proportion to increases in motor vehicle use and as a result of demands for additional bus and truck transportation, attention must be focused upon the need for providing accessibility to concentrated business districts, to the provision of adequate and acceptable off-street parking facilities, and to the adoption of traffic control regulations designed to expedite the movements of motor vehicle traffic in safety on present street systems. Through the application of traffic engineering techniques and with the cooperation of all interested agencies, including city, county, State, Federal and all special interests, motorists may look forward to a continuation of use of their individual automobiles in traveling with convenience and safety to work, to shop and to places of recreation.

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By E. B. Shrope
Principal Civil Engineer
Bureau of Highway Planning
New York State Department of Public Works

The Effect of Median Dividers on Vehicle Placement*

IN the spring of 1950, the New York State Department of Public Works, in cooperation with the Bureau of Public Roads, initiated a research program in an attempt to add to the fund of knowledge on vehicle operation as it relates to highway design. It was agreed that one of the first subjects for investigation would be the study of median dividers in relation to their effect on positioning of free moving passenger cars.

The Long Island Parkway System offered an unusually fertile field for conducting such tests, presenting a variety of highway characteristics and types of medians.

Figure 1 shows the six types of median traffic dividers in use on the Long Island Parkway System.

In addition to the six types of median dividers, the test sites on limited access parkways provided the following features: different lane widths, different curb heights, tangent and curved roadway alignment, wide variation in traffic volumes, flat grades, elimination of the effects of all type commercial vehicles and marginal interference.

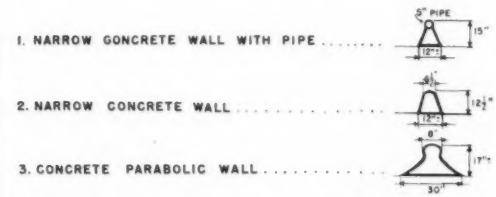

Fig. 1
Types of Median Traffic Dividers Studied.

Figure 2 shows a typical pattern of the plottings for a test. Similar plates were prepared for each individual test and in all cases the plotted points were found to follow a straight line variation. The points in the graph were studied and the mean straight line variation between placement and volume drawn.

Referring to Figure 2 it will be noticed that the two lines are not parallel indicating that cars travel further apart or closer to the pavement edges as the volumes increase.

During the tests the volumes in the two lanes ranged from about 500 to 2700 V.P.H. In order to make a comparison of the effect of the different types of medians, it was necessary to make an analysis of the various tests at the same traffic volume. The table shows the tabulation of this analysis. The average position of all cars at 1500 V.P.H. is indicated.

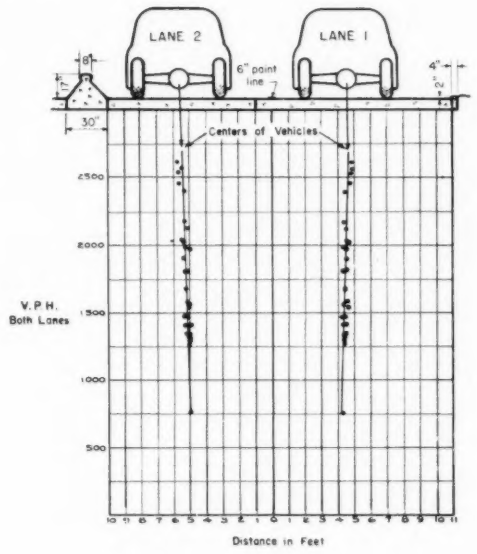

Fig. 2
Typical Plotting of Field Data

COLLATION OF TESTS WITH TYPE MEDIAN SHOWING AVERAGE PLACEMENT OF CARS AT 1500 V. P. H.

TEST	CURVE	TOTAL WIDTH LANE NO 2	LANE NO 1	MALL TYPE	X	6'3"	Y	6'3"	Z
					LANE 2			LANE 1	
14	2°	10' 21'	11'	30"	1.45		3.35		3.60	
15	2°1	10' 21'	11'	30"	1.65	1.5'	3.35	3.3'	3.40	3.6'
16	1.25°	10' 21'	11'	30"	1.85		3.05		3.50	
17	1.25°	10' 21'	11'	30"	1.15		3.45		3.80	
8		10' 21'	11'	6" line	1.85		3.3		3.25	
9		10' 21'	11'	6" line	2.05	1.95'	3.6	3.45'	2.75	3.2'
1		10'9" 21'9"	11'		1.55		3.7		3.65	
2		10'9" 21'9"	11'		2.35		3.2		3.35	
13		12' 23'	11'	42'	2.85	2.65'	4.1	4.4'	3.45	3.35'
13A		12' 23'	11'	42'	2.45		4.7		3.25	
4		no lanes 22'			3.05	2.95'	3.2	3.3'	3.15	3.2' no lane line
5		no lanes 22'			2.85		3.35		3.20	no lane line
11		13' 25'	12'	9'	3.35	3.4'	5.2	4.9'	3.80	4.1' no curb
12		13' 25'	12'	9'	3.40		4.65		4.35	no curb
6	78°	10' 21'	11'	6" line	2.70		2.95		2.70	
7	78°1	10' 21'	11'	6" line	1.65		2.65		4.10	
3	4.1°	no lanes 22'			2.80		2.75		3.85	no lane line
10	1.85°	13' 25'	12'	9'	4.10		4.45		3.80	

MEMBERSHIP INFORMATION
may be obtained by writing to:
Executive Secretary
Institute of Traffic Engineers
Strathcona Hall
New Haven 11, Connecticut

*Briefed from *Highways With a Narrow Median*, Highway Research Board, Bulletin No. 35, Washington, D. C., May 1951.

The Most Accurate Yardstick for Measuring the Dependability of a Parking Meter

is its ON-THE-STREET Performance Record!

Sure—laboratory tests are important. But for accurate proof of a meter's dependability, nothing compares to the on-the-street performance records—not for a year or two, but from five- to ten-year stretches. There you have the real test of a meter's worth, a true picture of what you can expect through the years.

MI-CO's have an enviable record for low upkeep costs and consistently high earnings over long periods of time. One reason: *There just isn't any complicated mechanism in a MI-CO meter to break down.* And this fact, coupled with unusually sturdy construction, accounts for MI-CO's ability to give low-cost, dependable service far beyond that of most meters.

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If you are considering the adoption of metered parking, it will pay you to contact MI-CO. Upon request we'll be glad to submit on-the-street records of hundreds of installations, some ten years old, and other important data.

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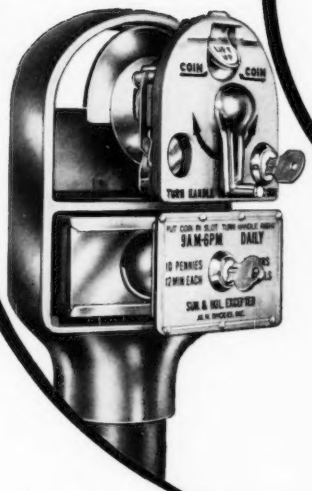

HERE'S PROOF

DEPARTMENT OF PUBLIC SAFETY
CITY OF PASSAIC, NEW JERSEY
Julius J. Cinamon, Director
POLICE DIVISION

EDWARD BOYKO
CHIEF OF POLICE

MICHAEL E. WYHNE
DEPUTY CHIEF OF POLICE

August 22, 1951.

Parking Meter Company of N. J.
663 Main Avenue
Passaic, New Jersey.

Dear Mr. Bryne:

Reference is made to your recent letter requesting information relative to the Pathfinder parking meters installed in the City of Passaic on January 5, 1937.

One hundred and twenty-two (122) of the original one hundred and twenty-seven (127) meters have been in continuous operation on West Main and Passaic Avenues since the date of installation.

They have proved to be rugged, simple and economical to maintain. We have been more than satisfied with the performance of these meters as an aid in parking control.

The cooperation of your company and your manufacturer has always been available and at our service when needed which we fully appreciate.

We are pleased to recommend your meter to any municipality considering the installation of parking meters.

Very truly yours,

JULIUS J. CINAMON
DIRECTOR of PUBLIC SAFETY.

JJC/n.

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Here is proof! Fourteen years of continuous, economical performance from Rhodes' earliest model, and they're still giving round-the-year service.

And the "Hurricane" model, Mark-Time Manual Parking Meter . . . the finest in its field . . . is engineered for even greater simplicity and durability, while still retaining the basic design that has for many years made Rhodes parking meters the first choice for traffic control and economical operation in all types of weather.

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Type GFM *Super-Trafflex* Master Controller for the Automatic Selection of Five Time Cycles

Type GF4-TD Triple Dial *Super-Trafflex* Secondary

Type GF-4 Single Dial *Super-Trafflex* Secondary

The Crouse-Hinds *Super-Trafflex* Control System, with its unfailing "memory," will methodically carry out your most complex instructions down to the last detail, week after week and year after year. All you have to do is "give the orders" by making the appropriate settings, based on your analysis of the traffic pattern.

The Crouse-Hinds *Super-Trafflex* Control System is a product of engineering skill and precision manufacturing. It is the most flexible and reliable control system available. The basic principle of the *Trafflex* System has been used successfully for more than twenty-five years. Today's *Super-Trafflex* embodies the latest improvements and is endorsed by leading traffic engineers in all parts of the country.

The system consists of a *Super-Trafflex* Master Controller located at a convenient central point and *Super-Trafflex* Secondary Controllers located at each of the controlled intersections.

The Master Controller is the "master-mind" that controls the speed at which traffic may flow by acting upon the *Super-Trafflex* Secondary Controllers, slowing them down or speeding them up as required, changing from one dial to another, keeping them in proper time relationship with each other, and completely supervising their operation at all times

Other outstanding features of the system are:

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2. Full flexible, progressive operation with remote cycle change from the master.
3. Time cycle range 40 to 120 seconds or 30 to 90 seconds. Can be set for any time cycle within these ranges in steps of 1 second.
4. One master controller can operate single dial, double dial, or triple dial secondary controllers.
5. Any time cycle selected at the master can be used on any dial.
6. On multi-dial controllers the dials are geared together and the zero points are always in the same relative positions.
7. Cam shafts always remain in step with the dial.
8. Controllers remain in step when changed from one dial to another.
9. Controllers remain in step when changed from one time cycle to another.
10. The only re-synchronizing interval is when changing from one offset to another and this is never longer than one time cycle.

Whatever your traffic problem may be, the amazing Crouse-Hinds *Super-Trafflex* Control System can handle it. Send for additional information today!

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New Appointments . . .

Edgar F. Copell (Mem., ITE) has been appointed Commissioner of the Boston Metropolitan District Commission by Governor Paul A. Dever. Mr. Copell took the oath as Commissioner at ceremonies held in Boston on November 25, 1951.

The Metropolitan District Commission has jurisdiction over a majority of the important arterial streets in the Boston Metropolitan area. The Commission is subdivided into the five departments of water; sewer; parks; beaches and construction. It has its own police force and traffic agency.

Mr. Copell brings to the Commission many years of traffic engineering experience. Along with his other responsibilities his experience in the application of sound traffic engineering principles will be applied in the relief of traffic problems in the Metropolitan area through traffic regulation, planning and construction.

Mr. Copell has been with the Massachusetts Department of Public Works since 1923. He was promoted to State Traffic Engineer in 1935 and has more recently been Executive Administrative Assistant to the Department.

—o—

J. A. (Tony) Carrothers (Assoc. Mem. ITE) will become the traffic engineer of Dayton Ohio. "Tony" is a civil engineering graduate of the University of Detroit. Since his undergraduate work he has studied city planning at Wayne University also in Detroit and is a graduate of the Yale Bureau of Highway Traffic.

Since entering the traffic field he has worked six years as assistant traffic engineer with the Detroit Traffic Engineering Bureau; one year in the U. S. Army Transportation Corps as a civilian traffic engineer and two years as Chief Traffic Engineer with the Association of Casualty and Surety Companies. Since April 1949, Mr. Carrothers has been the City Traffic Engineer of Schenectady, New York.

The population of Dayton is 270,000. As Traffic Engineer of Dayton, Mr. Carrothers will be the head of his division under the Service Director. The traffic engineering position in Dayton was first created by ordinance in 1949. In 1950 the traffic engineering budget was eliminated when the Ohio Supreme Court invalidated the Ohio State income tax. Upon reinstatement of this tax by Dayton's voters, provision was made in the reexpanded city budget for a new traffic engineer. Tony will assume his responsibilities in Dayton on January 1, 1952.

Secretary's Column

The proposed amendments to the By-Laws of the *Institute* creating Sustaining Organizations and lowering the fees and dues of Affiliates which were recently submitted to the vote of the membership were passed by heavy majority of ballots cast.

The first of the new amendments reduces Affiliate dues and fees from $25.00 to $15.00. This amendment becomes effective January 1, 1952 at the beginning of the fiscal year for membership dues.

The amendment creating the new grade of Sustaining Organization becomes effective immediately, and is incorporated in the By-Laws of the *Institute* as follows:

ARTICLE XI

Sustaining Organizations

Sec. 1. Any firm, association or corporation desirous of aiding the *Institute* and furthering its objectives may become a Sustaining Organization upon invitation of the Board of Direction, and payment of a minimum of $100.00 per annum.

Sec. 2. A Sustaining Organization may designate one representative to be listed in the *Institute's* Yearbook. This representative may take part in all activities of the Institute except to vote and hold office. This representative shall receive the *Institute's* current publications available on membership or subscription basis.

Sec. 3. A Sustaining Organization may designate up to three individuals to serve in advisory capacities with various technical committees of the *Institute*, but not more than one individual may be designated to serve in such an advisory capacity to any one committee.

Sec. 4. Upon receipt of payment, and in due course, the *Institute* shall present to the Sustaining Organization an official certificate with the *Institute's* seal, bearing the signature of the President and Secretary-Treasurer and the effective year.

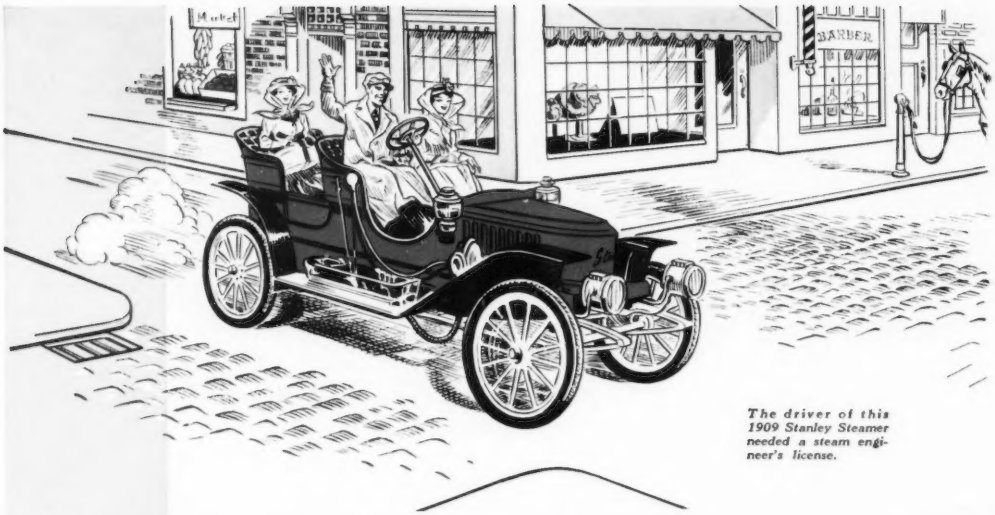
Sec. 5. Upon information coming to its notice, the Board of Direction may refuse to accept the support, or continued support, of a Sustaining Organization at any time after giving due notice and opportunity to be heard if desired.

Organizations wishing to become Sustaining members are invited to write to the Executive Secretary for further details. Those organizations wishing to cooperate with the *Institute* on technical projects should become Sustaining Organizations as soon as possible to have the benefit of the full year's activities of the various technical committees which are now being formed.

It is hoped that Sustaining Organizations will also contribute technical materials for publication in "Traffic Engineering" magazine.

Incidentally, we have received many favorable comments on the Convention issue. Your Editor wishes to thank and give full credit to Henry (Hank) Barnes, Traffic Engineer, Denver, Colorado, for the fine pictures taken at the Annual ITE Meeting and used in the Convention issue. We also wish to thank the Associate Editors and others contributing materials to "Traffic Engineering."

Fred W. Hurd



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Model 1022 Super Electro-Matic brings 2-phase intersection control to its highest pitch of efficiency. Volumes are "counted-in" on both phases. Density of moving traffic is measured and waiting time evaluated. All intervals are continuously adjusted for best over-all operation. Needless delay is entirely eliminated. Its "platoon responsive" feature facilitates progression through a series of 1022-controlled intersections, without interconnection.

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Personalities . . .

M. EARL CAMPBELL (Mem., ITE) is a native West Virginian. He received his early education there at Morris Harvey College and West Virginia University. In 1945 he was an Automotive Safety Foundation Fellow at the Yale Bureau of Highway Traffic.

Earl is a registered civil and structural engineer in West Virginia, a member

of the West Virginia Society of Professional Engineers, National Society of Professional Engineers, American Society of Civil Engineers and several civic and professional organizations in Washington, D. C., and Arlington, Virginia.

A number of articles for state and national magazines have been written by Earl, and his thesis "Toll Bridge Influence on Highway Traffic Operation" was published by the Yale Bureau of Highway Traffic in cooperation with the Eno Foundation. He has lectured at Georgia Tech, University of Missouri, Kansas State College, University of Colorado, Louisiana State University, University of California at Berkeley, and the Yale Bureau.

Earl's engineering experience has been varied and interesting as he has worked in the fields of location, design, construction, right-of-way, planning and traffic, structural and mining. His major branches were civil, structural and mining.

In 1929, while party chief on the construction of the N. F. & G. Railroad, he had the thrill of driving a mile long tunnel through from each side of the mountain, meeting in the center with less than a quarter inch error in line and grade.

Among other positions Earl has held are: Kanawha County Engineer, Engineering Assistant to State Road Commissioner, Regional Construction Engineer, and State Planning Engineer. He resigned his position as State Planning Engineer of the State Road Commission of West Virginia, to become Staff Engineer with the Highway Research Board, working in the fields of traffic and operations, and economics, finance and administration.

Earl's hobby is writing poetry. He is collaborating with a talented Arlington musician and composer on two books of songs to be published soon. He recently completed the lyrics for three anthems which were sung at the dedication of the new educational building of his church.

Earl is a dyed-in-the-wool family man. His two eldest children have flown the nest. He is proud of being the first father to have a second generation student at the Yale Bureau of Highway Traffic. Earl Wilson completed the Bureau's traffic engineering course in the Spring of 1951 (five years after his dad), and is now head of the traffic section of the planning division of the State Road Commission of West Virginia. Beulah, married in 1945, is now the mother of two fine boys.

The two younger children are still with their mother and dad at their North Arlington, Virginia, home. They are all active in the Memorial Baptist Church where Earl sings tenor in the choir. He is teacher of a men's class, a member of the Board of Christian Education, and has just completed a term as chairman of the Board of Deacons.

LOOKING AHEAD

JANUARY 14 - 18, 1952—WASHINGTON, D. C.
Highway Research Board. Annual Meeting.

JANUARY 21-24, 1952—HOUSTON, TEXAS
American Road Builders Association. 50th Anniversary Convention.

FEBRUARY 6-8, 1952—LOS ANGELES, CALIF.
Fourth California Conference on Street and Highway Problems; University of California.

LLOYD FORREST RADER (Mem., ITE) is professor of civil engineering in the University of Wisconsin in charge of traffic engineering, highway engineering, and city planning. He has taught many students in his 22 years of teaching experience in engineering colleges. He was a member of the faculties of the University of Nebraska and the

Polytechnic Institute of Brooklyn before going to Wisconsin in 1940.

Lloyd's engineering training was obtained at the University of Michigan where he was a student in the first course in traffic control offered in that institution. He has earned the bachelor's, master's, and doctor's degrees in civil engineering in the University of Michigan with specialization in highway engineering. Lloyd held the Roy D. Chapin fellowship in highway engineering at the University of Michigan in 1924-25. He was also a graduate student at Indiana University.

After graduation from college, Lloyd worked three construction seasons for the Pennsylvania State Highway Department on concrete road construction. He later worked for the Nebraska State Highway Department on road and bridge design.

Rader has also had experience as a naval officer. He attended the U. S. Naval Academy at Annapolis, Md., for three years and has been a member of the naval reserve for a number of years. During World War II, he served as an officer in the Civil Engineer Corps of the Navy for four and one-half years. Rader has served on several committees of the *Institute*. During 1936-37 he was the editor of "Traffic Digest," the forerunner of the present "Traffic Engineering." He contributed

a paper to the 1933 Proceedings of the Institute of Traffic Engineers on "The Law of Negligence as Applied to Traffic Accidents."

Rader has contributed a number of technical papers at meetings of engineering societies and has published papers in proceedings and technical magazines. He has also conducted research on engineering materials, particularly on bituminous paving mixtures. His paper on "Investigations of the Physical Properties of Asphalt Paving Mixtures at Low Temperatures" was entered in world-wide competition at the VIIIth Congress of the International Road Congress at The Hague in 1938 where it was awarded the "Prize of Belgium" by the Government of Belgium as the paper making the most constructive contribution. Rader was the second American to win the "Prize of Belgium," it having been awarded to E. W. James in 1930.

Rader is co-author of "Materials of Construction" 5th Edition by Mills, Hayward, and Rader published by John Wiley and Sons, Inc.

Recently Professor Rader has been serving as Chairman of Committee Four on Transportation of the Civil Engineering Division of the American Society for Engineering Education. He presided at the Transportation Session of the ASEE held at Lansing, Michigan, in June, 1951. Professor Rader is Chairman of Committee A-4 on Design of Bituminous Paving Mixtures of the Highway Research Board, National Research Council, and also is Chairman of Subcommittee B-2 on Physical Tests of Compressed Bituminous Mixtures of the American Society for Testing Materials.

Lloyd has served as President and Director of the Association of Asphalt Paving Technologists. He is a member of the American Society of Civil Engineers, Society of American Military Engineers, National Society of Professional Engineers, Wisconsin Society of Professional Engineers, Chi Epsilon, and Sigma Xi. He is a registered professional engineer in New York and in Wisconsin and is Secretary-Treasurer of the Wisconsin Good Roads Association.

At the University of Wisconsin, in addition to teaching regular classes, Professor Rader has been active in conducting engineering institutes and short courses for practicing engineers.

Positions Available

The Citizens Traffic Safety Board, Chicago, Illinois.
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Apply: Franklin D. Sturdy, Managing Director, Room 1032, 111 W. Washington Street, Chicago, Illinois.

Baltimore, Maryland
Deputy Director, City Traffic Commission
Salary—$5100 to $6000 per year.
Minimum Qualifications—
Engineering Degree or registration as a professional engineer in the State of Maryland, or eligibility for registration therein by reciprocity; plus five (5) years of experience in traffic engineering, three (3) years of which must have been in responsible charge; provided, however, that satisfactory completion of a graduate course in traffic engineering may be substituted for two (2) years of the required experience.

Associate Traffic Engineer (2 vacancies)
Salary—$5100 to $5800 per year.
Minimum Qualifications—
Same as above with respect to education, registration, and substitution of graduate training—except traffic engineering experience and responsible charge as follows; plus four (4) years of experience in traffic engineering, one (1) year of which must have been in responsible charge.
Apply: City Service Commission of Baltimore
Room 107, City Hall, Baltimore, Maryland.
Closing date for applications January 15, 1952.

SECTION NEWS

Midwest Section

On Thursday, November 15, 1951 the Midwest Section of the Institute of Traffic Engineers held a regular meeting at the Chicago Engineers' Club with about twenty-five members in attendance.

During the short business meeting, President Bill Marston announced the appointment of standing committees. The remainder of the meeting was turned over to the chairmen of the 1952 convention committees to allow them to hold meetings of their committees. Reports from each of the committees were then presented and discussed.

The meeting was adjourned by President Marston with the observation that plans for the 1952 convention are rapidly progressing.

Submitted by Ralph Gross
Secretary-Treasurer

Western Section

The Western Section has successfully held its Fourth Annual Meeting and has conducted the 22nd Annual Meeting of the *Institute*. For the first time, the *Institute* has met in annual convention west of the Mississippi. For the first time, a Section representing a wide geographical area, through team work has conducted an annual meeting. Every member of the Western Section is proud of the Section—individually and collectively.

The Section believes that its successes of the past year should be used as a springboard rather than a laurel to rest upon. Two important deficiencies deserve attention. (1) MEMBERSHIP—although the largest section there are still many eligible traffic engineers who are non-members. (2) PUBLIC RELATIONS—the 22nd Annual Meeting introduced many people and organizations to the *Institute* who heretofore have been strangers and who must be followed up with Section activities that will continue to place the *Institute* in a favorable light.

Soon the Section will announce the appointments of area Chairmen and a coordinated program of activities in each area will be developed. Subject to the approval of the area chairmen, the program next year will stress methods of alleviating the above deficiencies.

Reported by Don Berry
Secretary-Treasurer

Michigan Section

Twenty-eight members and guests of the Michigan Section met at the Hillcrest Country Club in the City of Mt. Clemens on November 6, 1951. These twenty-eight members, including seven that traveled over one hundred miles, braved a raging snow storm and blizzard to arrive at the meeting. After an excellent dinner was served, the meeting was called to order by President Arthur Gibson, who introduced all members and guests. Mr. Gibson gave a report on a refresher course for Registration for Professional Engineers which is to be given in the Horace H. Rackham Educational Memorial Building beginning on January 5, 1952. He informed the group that applications for the course must be filed by December 28, 1951. The Treasurer's report was given by Samuel J. Levine showing a balance of $76.14. The meeting was then turned over to the Program Committee composed of Sven Kansman, Walter Pletcher, William Marvin, and Samuel J. Levine.

A short movie issued by the U. S. Government called "The Mt. Clemens Story" was shown. Major Arthur C. Reinhardt of Selfridge Air Force Base was the guest speaker. He gave a very interesting talk on the Air Rescue Command.

President Gibson appointed Mr. Eisenach and Mr. Marvin chairmen of the next meeting to be held in January 1952.

Reported by Samuel J. Levine
Secretary-Treasurer

New York Section

A meeting of the New York Section was held on October 25, 1951 at the President Tavern. Twenty members and guests were present at this meeting which was principally a business meeting. The participation of the local section in the program of the Annual Meeting of the Greater New York Safety Conference was one of the major items discussed. President Ed Cyr appointed the Entertainment Committee for the next meeting which has been programmed for November 29. Mr. Harry Hemmings is chairman of this committee.

Reported by Louis E. Bender
Secretary-Treasurer

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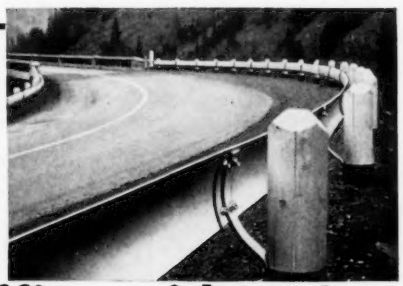

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Special Notice

The Program Committee of the Washington Section wishes to announce that it is arranging a dinner meeting to be held on the evening of Wednesday, January 16, in Washington during the Highway Board Meeting. The dinner will be *sandwiched* between the afternoon and evening Highway Research Board sessions. The exact time and place has not been determined, but all members and friends who will be in Washington at this time are cordially invited to attend.

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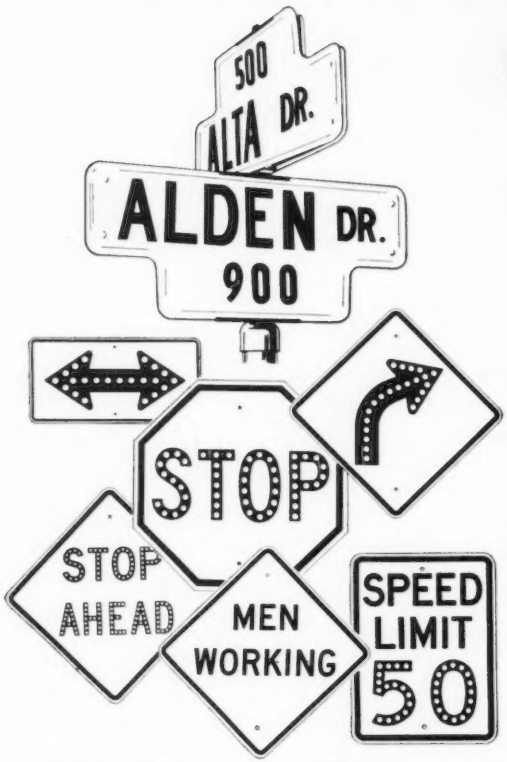

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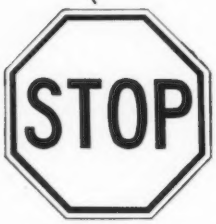

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COMPLETE ACCESSIBILITY and flexibility are two reasons Henry A. Barnes (right) Traffic Engineer, City and County of Denver, chose G-E Type F controllers for the new system he designed. G-E engineer, W. S. Pullen (center) points out how any color sequence is obtained with the unit signal contact drum; in his hand is the easily-removed Telechron (®) synchronous motor-unit drive with brake coil for remote synchronizing. At left, Gerald Rothweiler, Traffic Construction Superintendent, City and County of Denver, holds one of the centrally located electronic repeaters which vary the dial unit speed according to traffic needs.

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